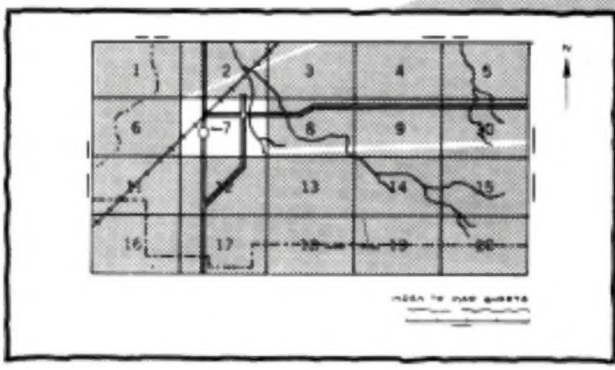
Soil survey of

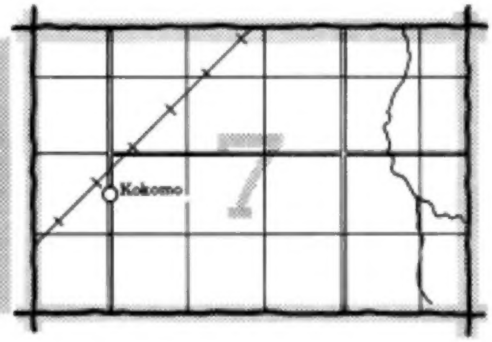
Butler County, Nebraska

United States Department of Agriculture, Soil Conservation Service
in cooperation with University of Nebraska, Conservation and Survey Division

HOW TO USE

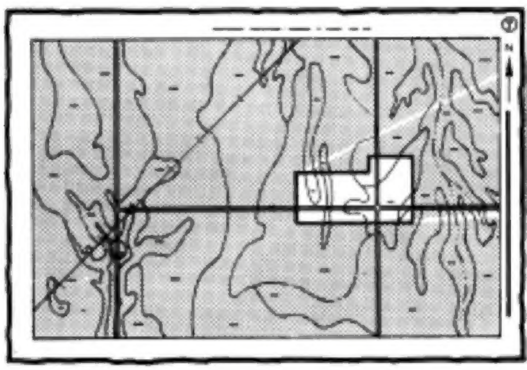
1. Locate your area of interest on the "Index to Map Sheets"

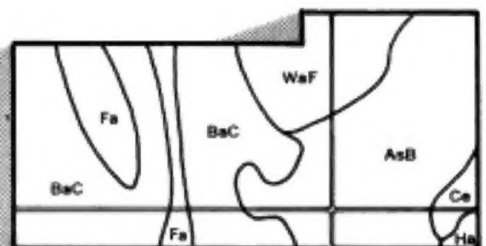




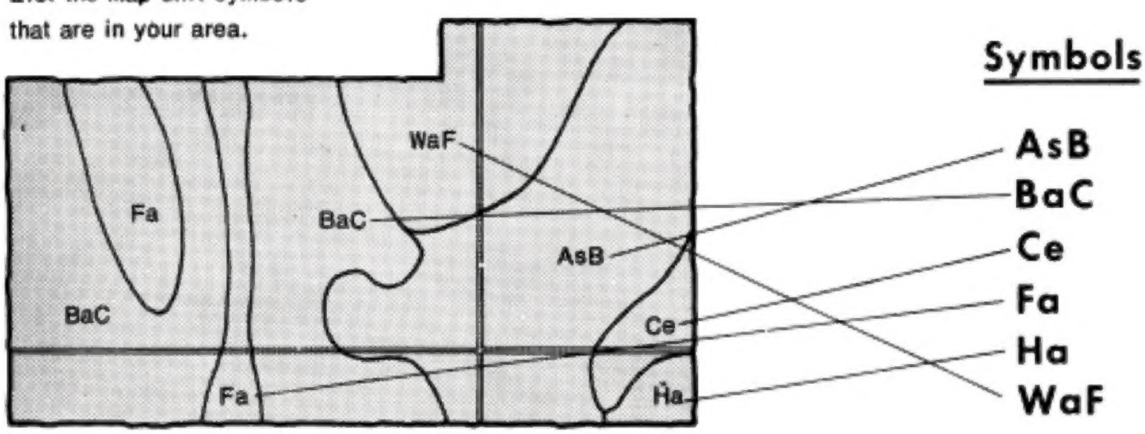
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



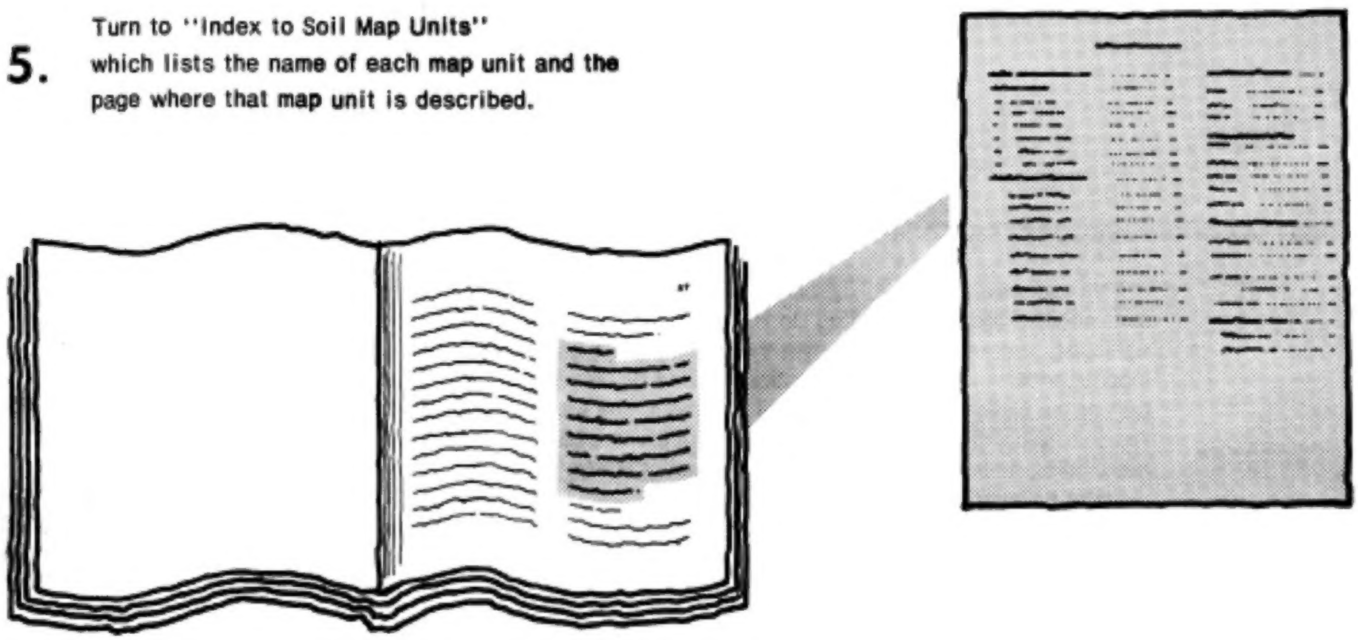


4. List the map unit symbols that are in your area.

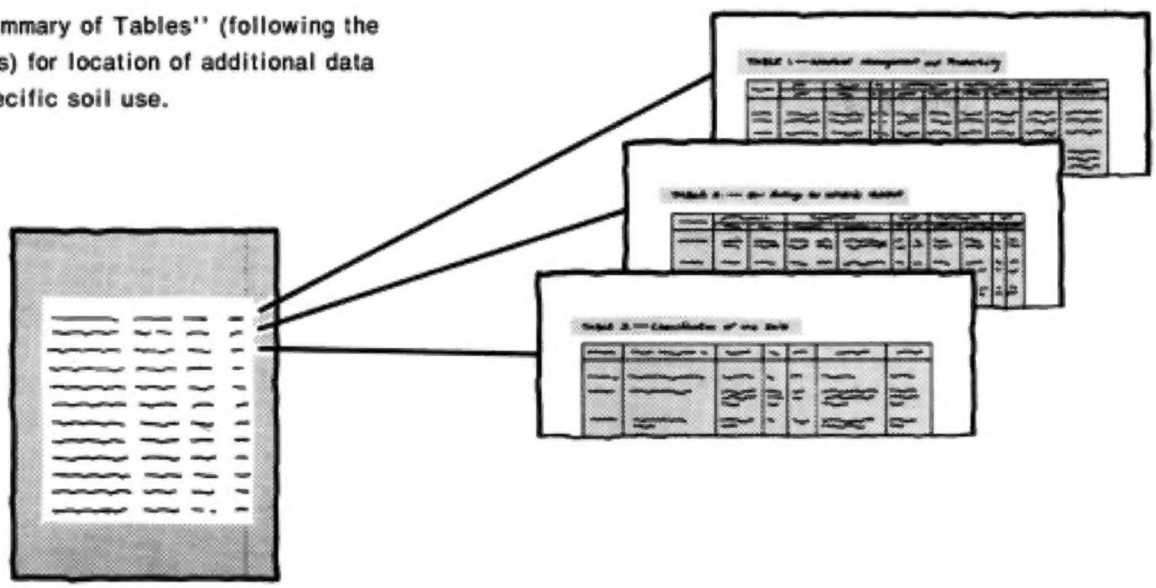


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey, and the University of Nebraska Institute of Agriculture and Natural Resources, Conservation and Survey Division, has leadership for the state part. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service and the University of Nebraska, Conservation and Survey Division. It is part of the technical assistance furnished to the Lower Platte South, the Upper Big Blue, and the Lower Platte North Natural Resources Districts. The Butler County Supervisors and the Lower Platte South, the Upper Big Blue, and the Lower Platte North Natural Resources Districts provided financial assistance to accelerate the completion of this survey.

Major fieldwork for this soil survey was done in the period 1974-1979. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Soils in the Sharpsburg-Steinauer-Pawnee association are used mainly for cultivated crops. In some places, the soils are in native grasses and are used as pasture.

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soil series

Issued February 1982

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foreword

This soil survey contains information that can be used in land-planning programs in Butler County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

A. E. Sullivan

Albert E. Sullivan
State Conservationist
Soil Conservation Service

soil survey of
Butler County, Nebraska

By Donald E. Kerl, Soil Conservation Service,
and Monte Babcock and Gary Halstead, University of Nebraska

United States Department of Agriculture, Soil Conservation Service
in cooperation with University of Nebraska,
Conservation and Survey Division

BUTLER COUNTY is in the east-central part of Nebraska (fig. 1). It is bordered on the south by Seward County, on the west by Polk County, on the north by Colfax and Platte Counties, and on the east by Saunders County. Butler County takes in an area of 588 square miles, or 372,480 acres.

Most of the land is used for farming, but small areas are used as pasture. Agriculture is the foundation of the economy of Butler County. Farming and agribusiness are the leading occupations. Corn is the main crop. Grain sorghum, soybeans, wheat, and alfalfa are other important crops. These crops provide feed for livestock as well as cash income.

Loess and alluvium cover most of the county. The soils that formed in glacial till are in the southeastern part of the county. In general, the western two-thirds of the uplands is more level and the eastern part is more rolling. Water erosion is the main hazard on upland soils. The uplands are dissected by several stream systems: Bone and Skull Creeks in the northeastern part, Coon and Oak Creeks in the southeastern part, the North Fork of the Big Blue River in the southwestern part, and Wilson and Deer Creeks in the north-central part. The soils in the stream valleys are silty.

The Platte River is the northern boundary of Butler County, and the Platte River Valley includes almost one-fourth of the county. The major soils in the valley formed in silty or clayey alluvium. The soils that formed in sandy alluvium range from deep to shallow over sand and gravelly sand. Wetness from the seasonal high water table is the main limitation, and flooding, which ranges from rare to frequent, is the main hazard.

This soil survey supersedes the survey of Butler County that was published in 1929 (*5*). It updates the earlier survey, provides additional information, and includes larger maps that show the soils in greater detail.

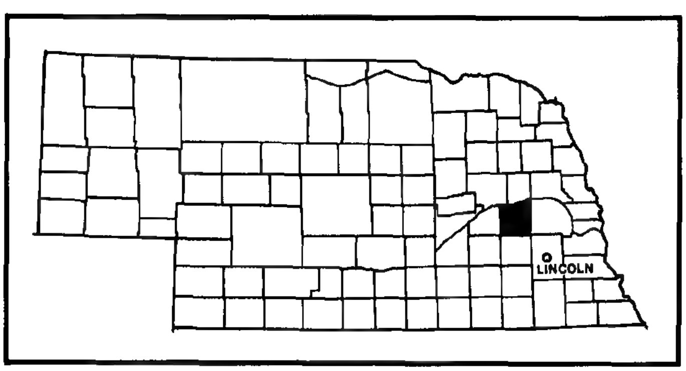

Figure 1.—Location of Butler County in Nebraska.

general nature of the county

This section provides general information concerning Butler County. It discusses history and population; community, cultural, and recreational facilities; transportation and markets; physiography, relief, and drainage; trends in agriculture; natural resources; geology and ground water; and climate.

history and population

Butler County was established in 1868. The area had been inhabited mostly by Pawnee Indians. Under the Preemption Act of 1841, settlers in the area could buy land for a dollar and a quarter an acre after they had cultivated it for one year. Under the Homestead Act of 1862, a settler owned his land after he had worked it for 5 years. Early settlers avoided tablelands and stayed close to the valleys. In those days the severe winters and disease took their toll, and grasshoppers frequently ruined the crops. The worst periods of drought were from 1880 to 1900 and from 1930 to 1940.

According to census figures, the population of Butler County had reached 14,606 by 1920, had decreased to 11,432 by 1950, and was 9,461 in 1970. The population of David City, the county seat, is about 2,500.

community, cultural, and recreational facilities

David City is the largest town in the county and is the county seat. It is centrally located. In the community there are many churches and a modern hospital, homes for senior citizens, a public library, a swimming pool, a large park with playground facilities and tennis courts, a golf course, a community center, and numerous service and social clubs.

Nearly all towns in Butler County have elementary schools, and there are also many rural elementary schools. David City, Brainard, and Rising City have high schools. Most school districts provide transportation for elementary and high school students.

The Big Blue River, the Platte River, and their tributaries provide sites for fishing, hunting, boating, and picnicking. There are many cabins and vacation homes along the Platte River and around lakes that formed in abandoned gravel pits in the Platte River Valley. Farm ponds and watershed structures also provide sites for fishing, picnicking, and hunting.

transportation and markets

U.S. Highway 81 borders Butler County on the west and provides a route to the north and south along the western side of the county. State Highway 15 runs north and south across the central part of the county through David City. State Highway 64 runs east and west across the northwestern part of the county and connects U.S. Highway 81 with State Highway 15. All towns in the county are connected by paved state highways or by paved or graveled state spurs and graveled county roads. Graveled or improved dirt roads that are maintained by the county are on most section lines.

The Union Pacific Railroad enters the county near Loma. It runs northwest through Brainard to David City then runs southwest through Rising City and leaves the county west of Rising City. The Burlington Northern Railroad enters the county south of Ulysses and runs in a northerly direction passing through Ulysses, Garrison, David City, and Bellwood. It leaves the county northwest of Bellwood.

Excellent market facilities for farm produce are available within the county and in the neighboring counties. Most of the towns in the county have grain elevators. Most of the grain is shipped to large markets. There are livestock sale barns in neighboring counties.

physiography, relief, and drainage

Butler County is in east-central Nebraska. The average elevation in the county is 1,450 feet above sea level. Elevation ranges from 1,300 feet on the Platte River in the extreme northeastern corner to about 1,670 feet in an area 2 miles north of Brainard in the east-central part of the county.

There are four physiographic regions within Butler County: plains, bluffs and escarpments, valleys, and rolling hills. The plains region extends from the Platte River breaks to the southern border and from the western border to the eastern third of the county. The rolling hills region takes in the eastern third of the county from the Platte River breaks to the southern border. The bluffs and escarpments region extends from the northeastern part to the northwestern part of the county in a continuous band along the Platte River breaks. The valley region is on bottom lands and terraces of the Platte and Big Blue Rivers and their tributaries.

The plains region consists of broad, loess-mantled uplands. It is the largest of the four physiographic regions. It makes up about 45 percent of the county. Most of this land is nearly level to very gently sloping. Except in some depressional areas, the drainage pattern is well established. This region is drained by the Big Blue River and its tributaries.

The bluffs and escarpments region consists mostly of moderately steep to very steep loess-mantled uplands. These uplands are dissected by many creeks and intermittent drainageways that empty into Clear Creek or directly into the Platte River. The breaks are from one-half of a mile to 3 miles wide and are about 100 to 150 feet high from the base to the crest. This region makes up about 6 percent of the county.

There are two valley regions in Butler County. One is on the bottom lands and terraces of the Big Blue River and its tributaries, and the other is on the bottom lands and terraces of the Platte River and its tributaries. Most of this land is nearly level or very gently sloping and is dissected by old channel creeks or intermittent drainageways. The Platte River Valley varies in width from less than 3 to nearly 6 miles. The Big Blue River Valley is about a mile wide at its widest part. The valley regions make up about 23 percent of the county.

The rolling hills region is in the eastern third of the county. The region consists mainly of hilly land that is gently sloping to steep. The ridges have rounded crests. The hills are mostly glacial till that has been eroded and mantled by loess. The loess mantle in the northern half of this region is very thick. Only a small part of the total area of the county is made up of soils that formed in till, but in the southern half of this region, the soils on nearly half of the acreage formed in till. The drainage pattern in this region is extremely well developed. Most of the southern half of this region drains into Oak Creek, and most of the northern half drains into Skull and Bone Creeks, which, in turn, drain into the Platte River. This physiographic region makes up about 26 percent of the county.

trends in agriculture

Most of the agricultural land in Butler County is cultivated cropland. According to Nebraska Agricultural Statistics, about 90 percent of the total acreage in the county is cropland. About 63 percent of the cropland is dry-farmed, and about 37 percent is irrigated. In 1974, according to the Census of Agriculture, about 45 percent of the harvested acreage was in corn, 22 percent was in grain sorghum, 12 percent was in soybeans, 12 percent was in wheat, 6 percent was in hay, and 3 percent was in oats.

Total cropland decreased by about 5 percent from 1969 to 1974, but the acreage of cropland harvested annually increased by about 17 percent. From 1969 to 1974, the acreage of corn harvested increased by about 18 percent, the acreage of sorghum increased by about 27 percent, the acreage of wheat increased by about 13 percent, and the acreage of soybeans increased by about 20 percent. The acreage of hay harvested decreased by about 22 percent.

Also, according to the 1974 Census of Agriculture, from 1969 to 1974 the number of cattle and calves decreased from 48,431 to 42,739. Hogs and pigs decreased from 37,731 to 26,472. These decreases in number of hogs and cattle are roughly proportional to the decrease in number of farms raising them; however, the number of cattle and hogs raised per farm increased slightly. The number of sheep in Butler County decreased from 8,952 to 4,992, or by 44 percent, from 1969 to 1974. The number of farms producing sheep decreased by 38 percent. The number of poultry, however, increased.

The 1974 Census of Agriculture also showed a decline in the number of farms in Butler County. There were 1,175 farms in Butler County in 1969 and 1,125 in 1974. Although the number of farms is decreasing, the acreage per farm is increasing. The average size of a farm was 284 acres in 1969; in 1974 the average size was 307 acres.

From 1974 to 1978, the acreage of irrigated land increased. Many new center-pivot irrigation systems were installed, and land that had not been irrigated because of its steepness was put under center-pivot irrigation. A lack of adequate precipitation during part of this period may have contributed to this increase.

natural resources

The main resource of Butler County is its soils. These soils are used to produce large amounts of feed grains, forage crops, and cash-grain crops.

Sand and gravel from pits in the Platte River Valley provide an ample supply of coarse material for use in road building and as an aggregate in concrete.

geology and ground water

All exposed earth materials in Butler County are unconsolidated deposits of Quaternary age (*3, 4*). Ranging in thickness from about 20 to about 400 feet, these deposits are loess (wind-deposited silt), till (unsorted rock debris left behind when continental ice sheets melted back after extending over eastern Nebraska), and alluvium (water-deposited sand, silt, clay, or gravel) deposited by ancient and modern streams. The Quaternary deposits rest on bedrock of Late Cretaceous age.

Loess is the most extensive surficial deposit on the uplands. Originally it blanketed the entire county, in some places to a depth of 100 feet or more. In the western third of the county, it was deposited on a constructional plain made up of alluvial deposits ranging in thickness from about 150 feet to about 250 feet. In the central part of the county, it was deposited on much thinner alluvial deposits that rest on till, which in turn rests on older alluvial deposits. In the eastern part of the county, the loess was deposited directly on till except in the few places where thin alluvial deposits intervene.

The loess surface is smooth over much of the uplands south and west of a line that extends generally eastward from the western border of the county to a point just north of David City. From there the line extends in an arc southeastward to a point east of Brainard and then generally southward to the south county border. This part of the uplands is drained by the Big Blue River and its shallowly entrenched tributaries.

The remainder of the uplands is hilly. The southeast-flowing drains in the headwaters of Oak Creek have removed nearly all the loess and exposed the underlying till in townships 13 and 14 N., R. 4 E. Elsewhere in the hilly area, including the upland slopes bordering the Platte River Valley, the hills have been shaped by north-flowing tributaries of the Platte River, and the till is exposed in very few places.

The original loess mantle has been removed entirely in the Platte River Valley. The material there consists of sediment (alluvium and colluvium) deposited by the upland drains that flow northward to the Platte River and of alluvium deposited by the Platte.

Water for domestic, municipal, and livestock use is supplied from wells. Farm ponds supplement the supply for livestock where well yields are small. Yields range from small, where the water-bearing material consists wholly of till, to large (more than 1,000 gallons per minute), where the water-bearing sand and sandy gravel are many feet thick. Irrigation wells of large capacity can be sunk on many farms on the western half of the uplands. On the eastern half of the uplands, yields are mostly less than 50 gallons per minute. Moderately large yields can be obtained in most places in the Platte River Valley.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

In Butler County, winters are cold because of incursions of cold continental air that bring fairly frequent spells of low temperatures. Summers are hot with occasional interruptions of cooler air from the north. Snowfall is fairly frequent in winter, but snow cover usually is not continuous. Rainfall is heaviest late in spring and early in summer. In normal years the annual precipitation is adequate for wheat, sorghum, and range grasses.

Table 1 gives data on temperature and precipitation for the survey area as recorded at David City, Nebraska in the period 1951 to 1976. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 25 degrees F, and the average daily minimum temperature is 15 degrees. The lowest temperature on record, which occurred at David City on January 27, 1963, is -24 degrees. In summer the average temperature is 75 degrees, and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred on July 25, 1956, is 106 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 29 inches. Of this, 21 inches, or 70 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 16 inches. The heaviest 1-day rainfall during the period of record was 7 inches at David City on June 24, 1963. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is 31 inches. The greatest snow depth at any one time during the period of record was 27 inches. On an average of 9 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 60 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 12 miles per hour, in spring.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit, or soil association, on the general soil map is a unique natural landscape. Typically, a soil association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in other associations but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

soil descriptions

loamy and sandy soils on bottom lands and stream terraces

Two soil associations are in this group, which makes up about 3 percent of the county. The soils are nearly level to gently sloping. Most of the acreage is in crops and is irrigated by sprinkler systems. In areas near the Platte River, most of the acreage is rangeland or native woodland.

Soil blowing, droughtiness due to the low or moderate available moisture capacity of the soils, and maintaining the content of organic matter are management concerns.

1. Alda-Boel-Barney association

Nearly level, somewhat poorly drained and poorly drained loamy soils that formed in alluvium; on bottom lands

This soil association consists of nearly level soils in long areas on the Platte River bottom lands (fig. 2).

This soil association covers about 9,430 acres, making up about 2 percent of the county. Alda soils make up about 29 percent of this association, Boel soils about 25 percent, and Barney soils about 23 percent. The remaining 23 percent is minor soils.

Alda soils are on long, smooth bottom lands. These soils are nearly level and somewhat poorly drained. The surface layer is dark gray and gray fine sandy loam. The underlying material, at a depth of about 14 inches, is light gray fine sandy loam in the upper part and light gray coarse sand in the lower part.

Boel soils are on wide bottom lands. These soils are nearly level and somewhat poorly drained. The surface layer is dark gray, calcareous loam. The transition layer is mixed gray and light brownish gray loam. The underlying material is light gray coarse sand, sand, and fine sand.

Barney soils are on the lowest part of the Platte River bottom lands. They generally are under a cover of native grasses and trees. These soils are nearly level and poorly drained. The surface layer is grayish brown, calcareous loam. The underlying material, at a depth of about 7 inches, is stratified fine sand.

The minor soils in this association include Inavale soils. Inavale soils are gently sloping and somewhat excessively drained. They generally are on sandy ridges that are somewhat higher than the surrounding landscape.

Farms range from about 200 to more than 800 acres in size. They are diversified and generally combine cash-grain farming and livestock raising. About half of the farmland is cultivated, and about half is in pasture and native grasses that are cut for hay. Corn, wheat, and grain sorghum are the main crops. Very little of the farmland is irrigated. Irrigation wells in some areas of this association generally are low in yield.

Wetness, particularly in spring, is a limitation that can delay cultivation and planting. Flooding caused by ice jams can occur early in spring. Soil blowing is a hazard in dry periods unless measures are taken to protect the soil surface. Maintaining soil fertility is a concern in management.

Improved dirt and gravel roads are on some section lines, but on other section lines there are either no roads or only trails. Most of the farm produce raised in this association is marketed in nearby towns in Butler County or in adjacent counties.

Several gravel pits are in this association. Many areas around large gravel pits and some areas near the river are used as sites for vacation homes. Areas that border the Platte River provide good opportunities for hunting and fishing.

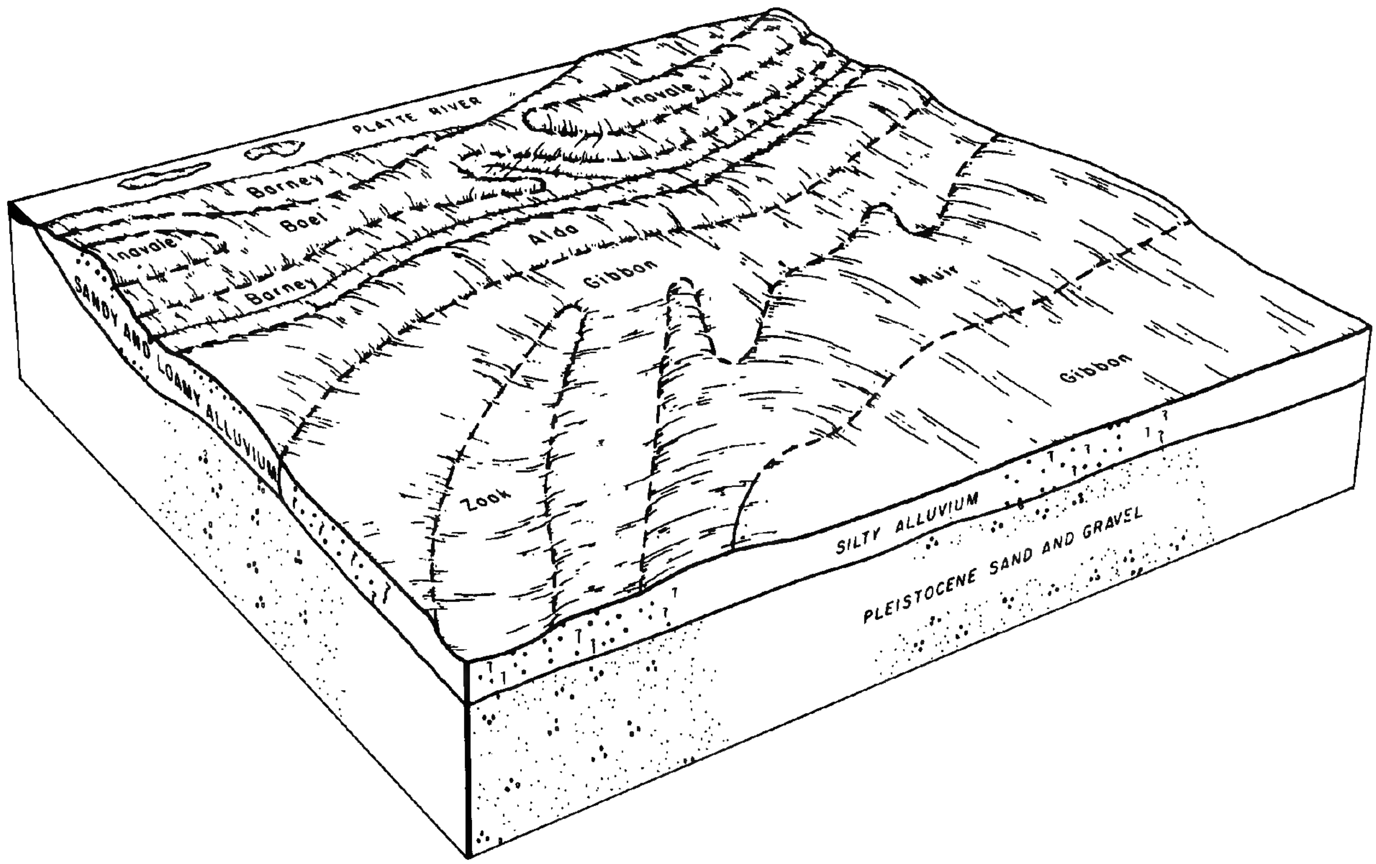

Figure 2.—Typical pattern of soils in the Alda-Boel-Barney association and the Gibbon-Muir-Zook association and relationship of the soils to topography and parent material.

2. Brocksburg-Simeon-Thurman association

Nearly level to gently sloping, well drained to excessively drained loamy and sandy soils that formed in loamy and sandy material; on stream terraces

This association consists mainly of nearly level to gently sloping soils on wide terraces that are about halfway between the Platte River breaks and the flood plain of the river.

This association covers about 4,495 acres, making up 1 percent of the county. Brocksburg soils make up about 38 percent of this association, Simeon soils about 28 percent, and Thurman soils 27 percent. The remaining 7 percent is minor soils.

Brocksburg soils are on wide, smooth, high terraces. These soils are nearly level and well drained. The surface layer is dark gray sandy loam over very dark gray loam. The subsoil is dark grayish brown loam in the upper part and brown silty clay loam and clay loam in the lower part. The underlying material, at a depth of 40 inches, is yellowish brown and light yellowish brown sand.

Simeon soils are on wide, high, sandy terraces. These soils are nearly level and very gently sloping, and they are excessively drained. The surface layer is dark gray and dark grayish brown loamy sand, and the transition layer is brown loamy coarse sand. The underlying material, at a depth of 20 inches, is pale brown and light gray coarse sand.

Thurman soils are on wide, somewhat hummocky, high terraces of the Platte River Valley. These soils are gently sloping and somewhat excessively drained. The surface layer is brown loamy fine sand, and the transition layer is yellowish brown loamy fine sand. The underlying material, at a depth of 16 inches, is yellowish brown fine sand.

The minor soils in this association are Ovina soils. Ovina soils are nearly level and very gently sloping and are on terraces. They are sandy and somewhat poorly drained.

Farms, on the average, are about 320 acres in size. They combine cash-grain farming and livestock raising. About 60 percent of the acreage is rangeland, under a cover of short native grasses. Cow-calf herds are kept on the grassland. Most of the soils in this association are

very droughty, and all the soils that are under cultivation are irrigated. The water supply for irrigation is adequate in most areas. Center-pivot irrigation is generally used because the soils are too rapidly permeable to be suited to gravity irrigation.

The hazard of wind erosion is severe. Care must be taken to leave cover of some type on these soils. Because plant nutrients are quickly leached, maintaining soil fertility is a concern in management.

Gravel or improved dirt roads are along most section lines. One blacktop highway runs across this soil association. Farm produce is marketed in the town of Bellwood or in neighboring counties.

Silty soils on bottom lands, foot slopes, and stream terraces

Four soil associations are in this group, which makes up about 20 percent of the county. The soils are nearly level or very gently sloping. Nearly all of the acreage is cultivated except for small areas along creeks and drainageways where the plant cover consists of introduced or native grasses. Most of the cultivated acreage is irrigated. Water erosion and flooding are the major hazards. Maintaining a high level of fertility and good surface drainage are concerns in management.

3. Gibbon-Muir-Zook association

Nearly level, well drained, somewhat poorly drained, and poorly drained silty soils that formed in alluvium; on bottom lands and stream terraces

This soil association consists mainly of nearly level soils on terraces and bottom lands that parallel the Platte River (fig. 2).

This association covers about 35,850 acres, making up about 10 percent of the county. Gibbon soils make up about 23 percent of this association, Muir soils 15 percent, and Zook soils 11 percent. The remaining 51 percent is minor soils.

Gibbon soils are on wide bottom lands of the Platte River. These soils are nearly level and somewhat poorly drained. The surface layer is very dark gray and dark gray, calcareous silty clay loam. The transition layer is gray, calcareous clay loam. The underlying material, at a depth of 19 inches, is light gray, calcareous clay loam in the upper part and sandy loam and loamy sand in the lower part.

Muir soils are on wide terraces of the Platte River. These soils are nearly level and well drained. The surface layer is dark gray and gray silt loam. The subsoil is brown and pale brown silt loam. The underlying material, at a depth of 36 inches, is pale brown silt loam.

Zook soils are on wide bottom lands of the Platte River. These soils are nearly level and poorly drained. The surface layer is very dark gray silty clay loam in the upper part and silty clay in the lower part. The subsoil is dark gray silty clay. The underlying material, at a depth of 51 inches, is light olive gray silty clay loam.

The minor soils in this association include Blendon, Cozad, Grigston, Hobbs, Lamo, Ovina, and Thurman soils. Blendon soils are loamy and well drained and are on the first terrace above the flood plain of the Platte River. Cozad soils are, for the most part, on foot slopes of the Platte Valley breaks. Grigston soils are nearly level and are on high bottom lands. Hobbs soils are on occasionally flooded bottom lands. Lamo soils are somewhat poorly drained and are on bottom lands. Ovina soils are sandy and somewhat poorly drained and are on terraces. Thurman soils are sandy and somewhat excessively drained and are on high terraces.

Farms, on the average, are about 480 acres in size. They are diversified and generally combine cash-grain farming and livestock raising. Corn is the main crop. Soybeans, grain sorghum, wheat, and alfalfa are also grown. The soils are mainly under irrigation because the supply of irrigation water is abundant. Beef cattle are fed on the abundant supply of cornstalks in the fall and are then fattened on grain.

The main concerns in management are maintaining soil fertility and applying irrigation water at the proper rate to obtain high crop yields. In some places, better surface drainage is needed to reduce flooding. On the somewhat poorly drained soils, wetness caused by the seasonal high water table is a problem.

Gravel roads are along most section lines. One blacktop highway runs across this association from east to west across the county. Farm produce is marketed mainly within the county or in adjacent counties.

4. Muir-Grigston-Cozad association

Nearly level and very gently sloping, well drained silty soils that formed in loess, alluvium, or colluvium; on stream terraces, foot slopes, and bottom lands

This soil association consists mainly of nearly level and very gently sloping soils in long areas on stream terraces and foot slopes.

This association covers about 17,075 acres, making up about 5 percent of the county. Muir soils make up about 55 percent of this association, Grigston soils about 16 percent, and Cozad soils 9 percent. The remaining 20 percent is minor soils.

Muir soils are on foot slopes and on the smooth part of wide stream terraces. These soils are nearly level and very gently sloping, and they are well drained. The surface layer is very dark grayish brown and dark grayish brown silt loam. The subsoil is brown to very pale brown silt loam. The underlying material, at a depth of 50 inches, is very pale brown silt loam.

Grigston soils are on wide, smooth stream terraces. They formed in outwash of old streams and drains. These soils are nearly level and well drained. The surface layer is dark grayish brown silt loam. The underlying material, at a depth of 19 inches, is mixed dark grayish brown and light gray silt loam that has some strata of dark gray silt loam.

Cozad soils are on foot slopes and on the higher part of stream terraces. These soils are very gently sloping and well drained. The surface layer is dark grayish brown silt loam. The subsoil is grayish brown and pale brown silt loam. The underlying material, at a depth of 29 inches, is pale brown and very pale brown very fine sandy loam.

The minor soils in this association include Blendon, Hobbs, and Zook soils. Blendon soils are on terraces. They are nearly level to gently sloping. Hobbs soils are nearly level and are on bottom lands adjacent to drains and streams. Zook soils are in depressions on bottom lands and are poorly drained.

Farms, on the average, are about 480 acres in size. Most of the acreage of this association is under cultivation. Corn is the main crop, and most of it is irrigated. Soybeans, grain sorghum, and wheat are also grown in small amounts. Many farms keep some hogs and feeder cattle to make use of grain and crop residue.

Wind and water erosion are slight to moderate hazards. Improvement of surface drainage is needed in some areas of Zook soils in this association. Maintaining soil fertility is a concern in management.

Gravel roads are on most section lines. Some paved highways cross this association. Farm produce is marketed mainly within the county or in adjacent counties.

5. Hall-Muir-Hobbs association

Nearly level and very gently sloping, well drained silty soils that formed in alluvium and loess; on stream terraces, foot slopes, and bottom lands

This soil association consists of soils on terraces and bottom lands adjacent to the Big Blue River. These soils, for the most part, are nearly level and very gently sloping, but on some of the terrace edges they are gently sloping.

This soil association covers about 6,780 acres, making up about 2 percent of the county. Hall soils make up about 33 percent of this association, Muir soils 21 percent, and Hobbs soils 18 percent. The remaining 28 percent is minor soils.

Hall soils are nearly level and are on terraces well above the flood plain. The surface layer is dark gray and dark grayish brown silt loam, and the subsoil is dark grayish brown and brown silty clay loam. The underlying material, at a depth of 39 inches, is pale brown silt loam.

Muir soils are nearly level and very gently sloping and are on foot slopes and terraces. The surface layer is dark gray and gray silt loam. The subsoil is brown and pale brown silty clay loam. The underlying material, at a depth of 36 inches, is pale brown silt loam.

Hobbs soils are nearly level and are on bottom lands adjacent to rivers and streams. The surface layer is grayish brown silt loam. The underlying material is stratified dark grayish brown to light brownish gray silt loam.

The minor soils in this association include Butler, Uly Variant, Kezan, Wood River, and Zook soils. Butler soils are on level terraces and have very slow surface drainage. Uly Variant soils are on gently sloping, eroded side slopes on the edge of terraces. Kezan soils are on bottom land that is frequently flooded, and they are poorly drained. Wood River soils are very gently sloping and are on terraces. They are somewhat poorly drained and are saline-alkali. Zook soils are on bottom lands and are poorly drained.

Farms, on the average, are about 300 acres in size. Generally, they are cash-grain enterprises or combine cash-grain farming and livestock raising. Nearly all of the acreage of this association is cultivated. Both dryland and irrigation management are used. Corn, grain sorghum, wheat, soybeans, and alfalfa are the main crops. Row irrigation and center-pivot irrigation systems are used. The major concerns in management in this association are maintaining soil fertility, the proper application of irrigation water, and the slight or moderate hazard of soil erosion. A concern on some minor soils is the saline-alkali conditions, which tend to delay tillage and limit crop growth. If these saline-alkali soils are irrigated, the main concerns are maintaining good tilth and properly managing irrigation water.

Some roads on section lines crossing the Big Blue River do not have bridges. Farm produce is marketed mainly in the towns of Ulysses and Surprise.

6. Hobbs-Kezan-Muir association

Nearly level and very gently sloping, well drained and poorly drained silty soils that formed in alluvium and loess; on bottom lands, foot slopes, and stream terraces

This soil association consists mainly of nearly level to gently sloping soils in narrow stream valleys, near creeks that dissect the uplands, and on narrow bands of the colluvial slope along the sides of valleys. The creek channels generally are small and have low gradient. They range from shallow to deeply entrenched. They meander through the bottom lands except where they have been straightened. Most of the creeks overflow and flood the bottom lands in periods of high runoff. On some of the bottom lands, there is a high water table.

This soil association covers about 11,860 acres, making up about 3 percent of the county. Hobbs soils make up about 28 percent of this association, Kezan soils 23 percent, and Muir soils 19 percent. The remaining 30 percent is minor soils.

Hobbs soils are nearly level and well drained and are on long bottom lands. The surface layer is grayish brown silt loam, and the underlying material is stratified dark grayish brown to light brownish gray silt loam.

Kezan soils are nearly level and poorly drained and are on narrow bottom lands adjacent to drainageways. The surface layer is stratified grayish brown and light brownish gray silt loam. The upper part of the underlying material is stratified dark gray to light brownish gray silt loam. The lower part is dark gray silt loam.

Muir soils are nearly level and very gently sloping and are well drained. They are on foot slopes and narrow terraces. The surface layer is dark gray and gray silt loam, and the subsoil is brown and pale brown silt loam. The underlying material, at a depth of 36 inches, is pale brown silt loam.

The minor soils in this association include Hastings, Judson, Sharpsburg, and Zook soils. Hastings soils are on side slopes of valleys. Judson soils are gently sloping and are in narrow bands on colluvial slopes on the sides of valleys. Sharpsburg soils are on side slopes of valleys. Zook soils are poorly drained and nearly level. They are on bottom lands.

Farms, on the average, are about 160 acres in size. They are diversified and generally combine cash-grain farming and livestock raising. Corn, grain sorghum, and soybeans are the main crops. Soils on foot slopes and bottom lands that are frequently or occasionally flooded are used mostly for grazing. Some cultivated soils that are well drained are irrigated with water pumped from creeks and rivers. The major concerns in management are flooding and wetness, which is caused by a high water table that limits crop growth. Some of the soils require tile drainage.

Roads are on most section lines. Farm produce is marketed mainly within the county. Numerous dams have been constructed on the creeks in this association to create pools for fishing.

silty soils on upland breaks

Two soil associations are in this group and make up about 6 percent of the county. The soils are gently sloping to very steep and are well drained to excessively drained. Most of the acreage is rangeland or pasture, but the soils in some areas are in thick stands of native trees. In a few cultivated areas, water erosion is the main hazard, and there are gullies and channel erosion in the drainageways. Proper grazing use that includes timely deferment of grazing and proper stocking rates are the main concerns in management.

7. Uly-Coly association

Moderately steep to very steep, well drained to excessively drained silty soils that formed in loess; on upland breaks

This soil association consists of steep or very steep soils on breaks and gently sloping to strongly sloping soils on uplands and narrow ridgetops (fig. 3). The association is on a long, narrow tract where the loess uplands border the Platte River Valley.

This soil association takes up about 7,800 acres, making up about 2 percent of the county. Uly soils make up about 46 percent of this association and Coly soils about 36 percent. The remaining 18 percent is minor soils.

Uly soils are on upland slopes. These soils are moderately steep to steep, and they are well drained and somewhat excessively drained. The surface layer is dark grayish brown silt loam, and the subsoil is pale brown silt loam. The underlying material, at a depth of 23 inches, is very pale brown, calcareous silt loam.

Coly soils are on upland slopes and breaks. These soils are moderately steep to very steep, and they are somewhat excessively drained and excessively drained. The surface layer is dark grayish brown, calcareous silt loam, and the transition layer is grayish brown, calcareous silt loam. The underlying material, at a depth of 9 inches, is pale brown, calcareous silt loam.

The minor soils in this association are Hastings, Hobbs, and Holder soils. Hastings and Holder soils are gently sloping to nearly level and are on ridgetops. Hobbs soils are along drainageways.

Farms in this association average about 450 acres in size, and farmsteads are widely separated. About 65 percent of the acreage is rangeland or pasture, and about 35 percent is cultivated. Wheat, alfalfa, and oats are the main cultivated crops. Raising livestock, mainly cow-calf herds, is the major enterprise.

Water erosion is the main hazard, both on rangeland and in cultivated areas. Sheet and gully erosion can be severe because of the steepness of slopes and lack of plant cover. The soils in this association are better suited to grasses than to cultivation. Good range management helps to keep the plant community in good condition and control soil erosion.

Gravel roads are on some section lines. Improved dirt roads are on others. Some section lines have only trails, and some are unmarked. Farm produce is marketed mainly in the county or in adjacent counties.

8. Crofton-Monona association

Gently sloping to very steep, well drained to excessively drained silty soils that formed in loess; on upland breaks

This soil association consists mainly of gently sloping to strongly sloping soils on uplands and moderately steep to very steep soils in drainageways. The soils are on a long, narrow tract of upland breaks bordering the Platte River Valley.

This soil association covers about 16,000 acres, making up 4 percent of the county. Crofton soils make up about 49 percent of this association and Monona soils about 30 percent. The remaining 21 percent is minor soils.

Crofton soils are on side slopes of uplands and breaks. These soils are strongly sloping to very steep, and they are well drained to excessively drained. The surface layer is pale brown, calcareous silt loam, and the subsoil is light yellowish brown, calcareous silt loam. The underlying material, at a depth of 13 inches, is very pale brown, calcareous silt loam.

Monona soils are on side slopes and narrow ridgetops of uplands. These soils are gently sloping to steep, and they are well drained. The surface layer is dark gray silt loam, and the subsoil is dark brown and brown silty clay loam in the upper part and pale brown, calcareous silt

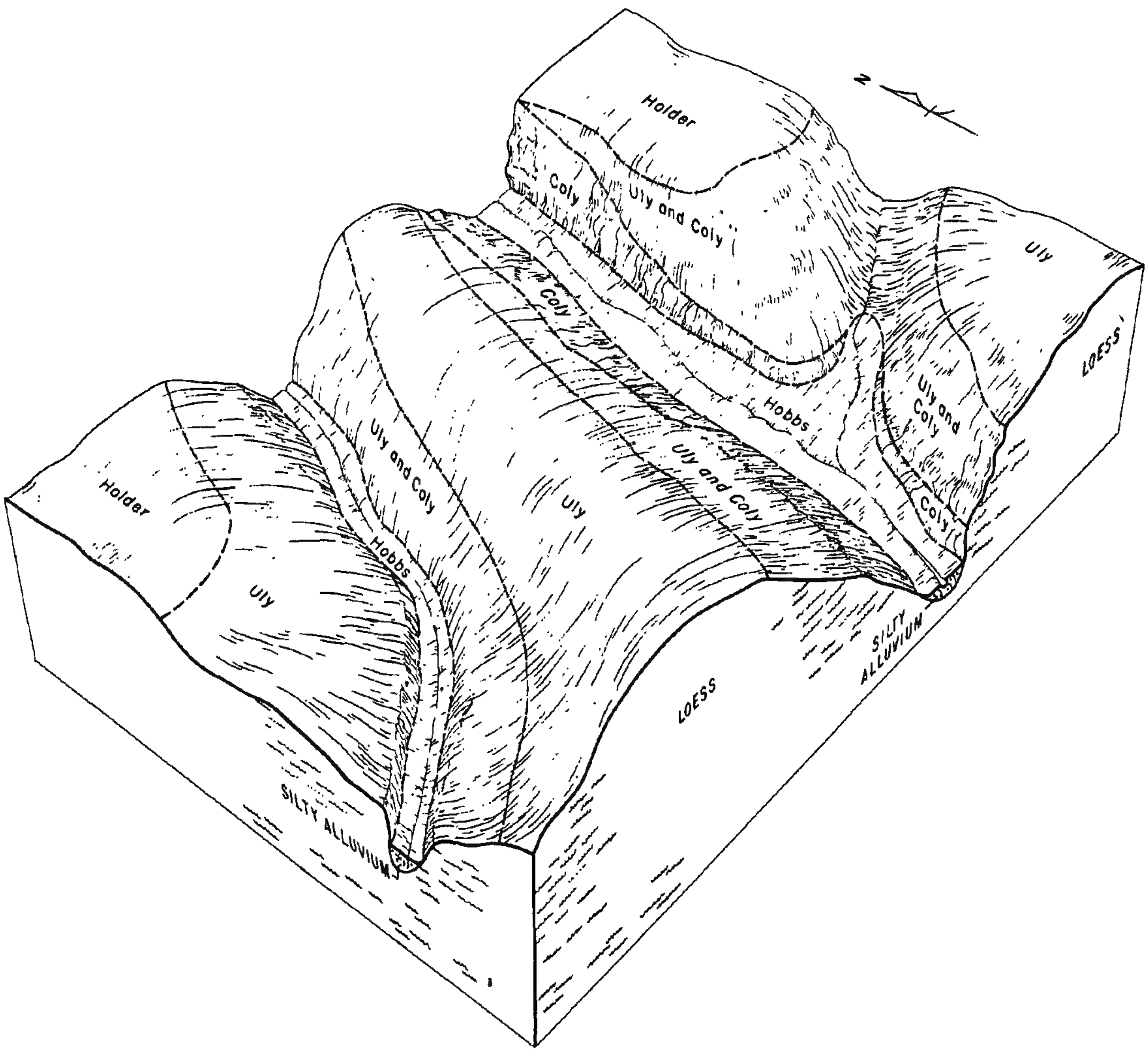

Figure 3.—Typical pattern of soils in the Uly-Coly association and relationship of the soils to topography and parent material.

loam in the lower part. The underlying material, at a depth of 54 inches, is light brownish gray, calcareous silt loam.

The minor soils in this association include Hobbs, Ponca, Steinauer, and Thurman soils. Hobbs soils are on bottom lands adjacent to the drainageways. Ponca soils are on side slopes of uplands. Steinauer soils are on steep slopes, and Thurman soils are on foot slopes near the Platte River Valley.

Farms, on the average, are about 400 acres in size. They are diversified and mainly combine cash-grain farming and livestock operations. Corn, soybeans, oats, grain sorghum, wheat, and alfalfa are grown under dryland management on the smoother, less steep soils. The soils have poor potential for irrigation because of the excessive slope. The steeper soils are used as pasture.

Water erosion is a severe hazard in most areas of this association. Conservation practices are needed to prevent severe erosion if these soils are cultivated or used for grazing.

Gravel or improved dirt roads are along most section lines. Farm produce is marketed mainly within the county or in adjacent counties.

silty, nearly level to steep soils on uplands

Two soil associations are in this group, which makes up about 15 percent of the county. The soils are nearly level to steep and well drained and moderately well drained. Most of the acreage is cultivated, except for some areas of rangeland or pasture along bottom lands and steep drainageways. Most of the cropland is dry-farmed. Water erosion is the main hazard. Maintaining a high level of fertility and planned grazing of rangeland or pasture are concerns in management.

9. Ponca-Sharpsburg association

Nearly level to steep, well drained and moderately well drained silty soils that formed in loess; on uplands

This soil association consists of nearly level soils on narrow divides, ridgetops, and narrow bottom lands and gently sloping to steep soils on side slopes (fig. 4). The dissected landscape has many small intermittent drainageways that join larger drainageways. Local relief is about 100 feet. Slopes 1,000 feet in length are common.

This soil association covers about 48,000 acres, making up 13 percent of the county. Ponca soils make up about 42 percent of this association and Sharpsburg soils about 16 percent. The remaining 42 percent is minor soils.

Ponca soils are mainly on narrow ridgetops and on long side slopes of uplands. These soils are gently sloping to steep. They are well drained. The surface layer is grayish brown silty clay loam, and the subsoil is pale brown and light brownish gray silty clay loam. The underlying material, at a depth of 22 inches, is light gray and very pale brown silt loam.

Sharpsburg soils are on divides and side slopes of uplands. These soils are nearly level to strongly sloping. They are moderately well drained. The surface layer is dark gray silty clay loam. The subsoil is silty clay loam that ranges from dark grayish brown in the upper part to

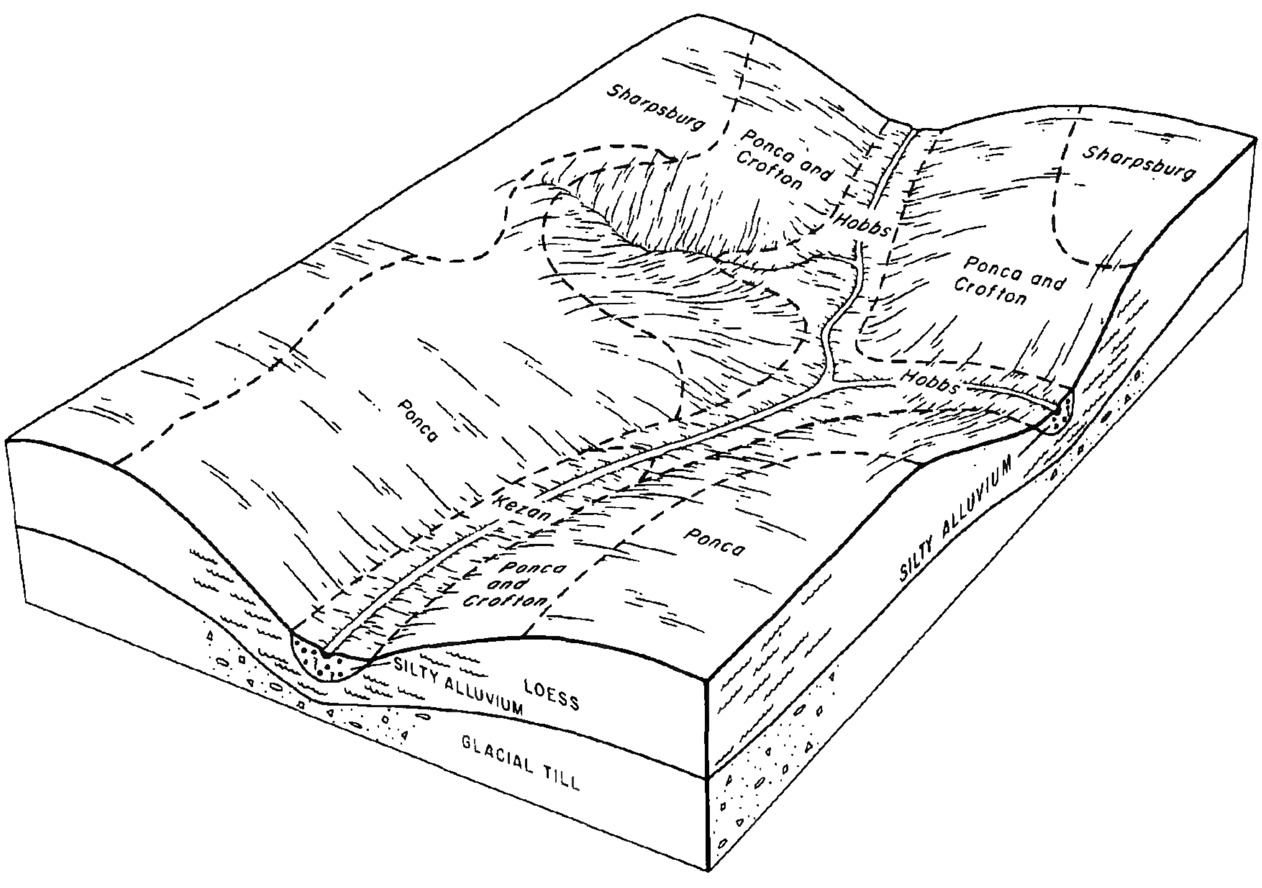

Figure 4.—Typical pattern of soils in the Ponca-Sharpsburg association and relationship of the soils to topography and parent material.

light yellowish brown in the lower part. The underlying material, at a depth of 46 inches, is very pale brown silt loam.

The minor soils in this association include Crofton, Hastings, Hobbs, Judson, Kezan, and Monona soils. Crofton soils border some of the more deeply entrenched drainageways. Hastings soils are on broad divides of uplands. Hobbs soils are well drained and are on narrow bottom lands. Judson soils are on colluvial foot slopes that border drainageways. Kezan soils are poorly drained and are on frequently flooded bottom lands. Monona soils are mainly on narrow ridgetops and side slopes of ridges.

Farms, on the average, are about 320 acres in size. They mainly combine cash-grain farming and livestock raising. Fattening hogs on locally produced grain and raising cow-calf herds are major enterprises. Most of the soils are dry-farmed, but some are irrigated by a center-pivot system. Corn, grain sorghum, alfalfa, and soybeans are the main crops. Some of the steeper soils and eroded areas have been seeded to grasses and are used as pasture. A few areas are in native grasses. Reseeding the steeper, eroded slopes to grass can provide increased forage for beef cattle.

If these soils are cultivated, erosion by water is the main hazard, and conserving water and maintaining fertility are the main concerns. Flooding is a hazard on bottom lands of the narrow upland drainageways. The organic matter content of the eroded soils needs to be built up.

Gravel or improved dirt roads are along most section lines. Grain and livestock markets are readily available within the county and in adjacent counties.

10. Sharpsburg association

Nearly level to strongly sloping, moderately well drained silty soils that formed in loess; on uplands

This soil association consists mainly of nearly level to strongly sloping soils on rolling loess uplands.

This soil association takes up about 8,575 acres, making up about 2 percent of the county. Sharpsburg soils make up about 66 percent of this association. The remaining 34 percent is minor soils.

Sharpsburg soils are on ridgetops and smooth side slopes of the loess uplands. These soils are nearly level to strongly sloping and are moderately well drained. The surface layer is dark gray silty clay loam. The subsoil ranges from dark grayish brown silty clay loam in the upper part to light yellowish brown silty clay loam in the lower part. The underlying material, at a depth of 46 inches, is very pale brown silt loam.

The minor soils in this association include Hobbs, Judson, Kezan, and Ponca soils. Hobbs soils are nearly level and well drained. They are on bottom lands along upland drains and streams. Judson soils are gently sloping and well drained. They are on foot slopes of the loess uplands. Kezan soils are nearly level and poorly drained. They are on bottom lands adjacent to upland drains. Ponca soils are gently sloping to steep and well drained. They are on steeper side slopes of the loess uplands.

Farms, on the average, are about 400 acres in size. They are diversified and mainly combine cash-grain farming and livestock enterprises. Corn, grain sorghum, soybeans, oats, wheat, and alfalfa are the main crops. The soils are mainly under dryland cultivation because of the steepness of slopes and the low yields of irrigation wells. Crop residue and some rough areas that are in permanent pasture are used for grazing. Some livestock is fattened for market.

Water erosion and consequent loss of soil fertility are hazards to crop production. Conservation measures are needed to prevent erosion.

Gravel or improved dirt roads are on most section lines. Farm produce is marketed locally or in adjacent counties.

Silty, nearly level to strongly sloping soils on uplands

The soils in this group make up about 47 percent of the county. The soils are nearly level to strongly sloping and are well drained and somewhat poorly drained. Nearly all of the acreage is cultivated, except for small areas of pasture near farmsteads and on steeper slopes. A large part of the acreage is irrigated, and both gravity and sprinkler irrigation systems are used. Well yields of irrigation water generally are very good. Wind and water erosion are the main hazards. Maintaining fertility and managing irrigation water are the main concerns in irrigated areas. Maintaining fertility and conserving moisture are primary concerns under dryland management.

11. Hastings-Butler association

Nearly level to strongly sloping, well drained and somewhat poorly drained silty soils that formed in loess; on uplands

This soil association consists mainly of soils on a broad upland loess plain (fig. 5). In most areas, the soils are nearly level or gently sloping. The association includes nearly level soils in depressions and gently sloping to strongly sloping soils on side slopes adjacent to upland drains, on stream terraces, and on bottom lands.

This soil association covers about 155,920 acres, making up about 42 percent of the county. Hastings soils make up about 78 percent of this association and Butler soils about 5 percent. The remaining 17 percent is minor soils.

Hastings soils are in broad areas on loess-mantled uplands. These soils are nearly level to strongly sloping, and they are well drained. The surface layer is grayish brown silt loam in the upper part and dark grayish brown silty clay loam in the lower part. The subsoil ranges from dark grayish brown silty clay loam in the upper part to

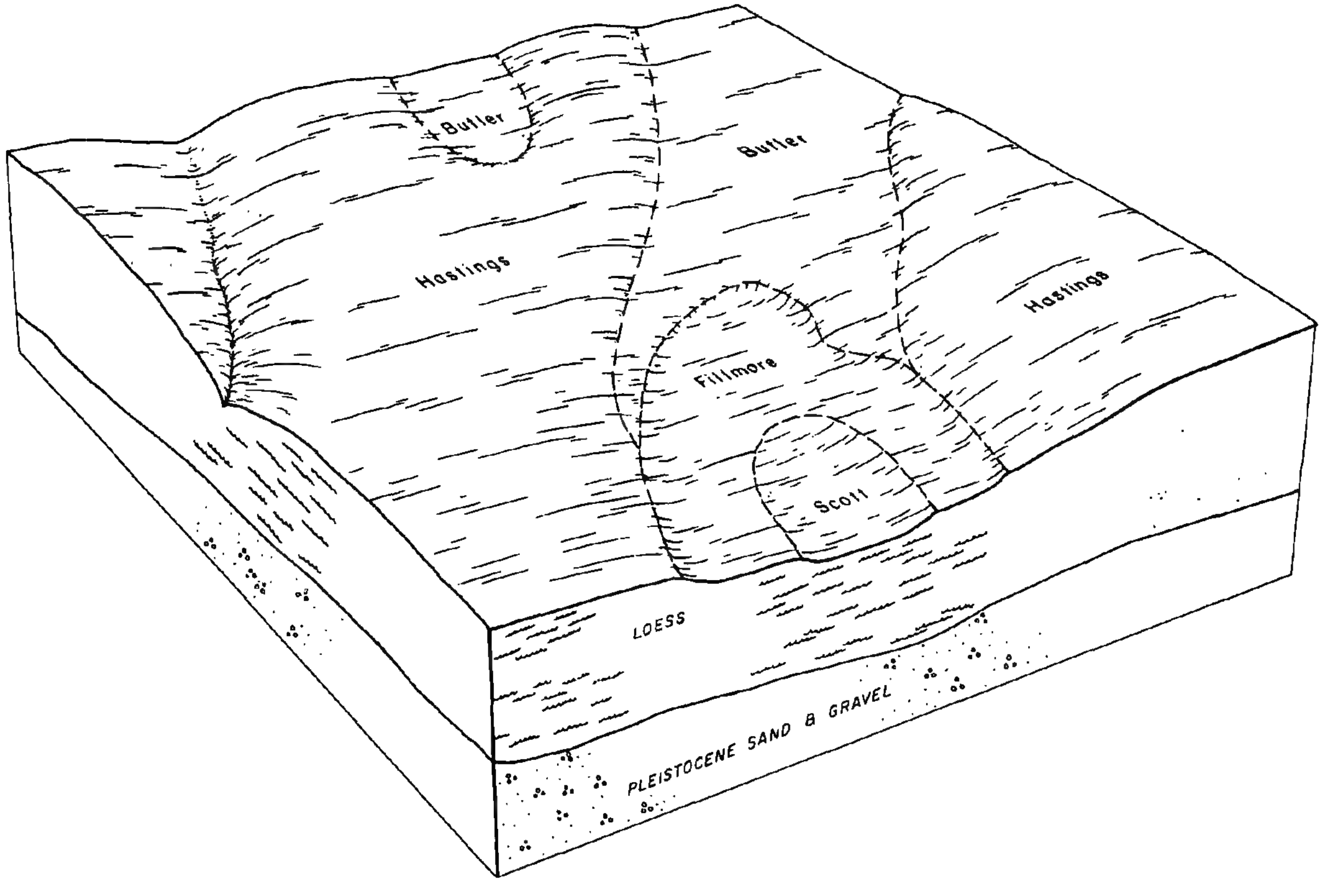

Figure 5.—Typical pattern of soils in the Hastings-Butler association and relationship of the soils to topography and parent material.

pale brown silty clay loam in the lower part. The underlying material, at a depth of about 40 inches, is light yellowish brown silty clay loam in the upper part and very pale brown silt loam in the lower part.

Butler soils are in shallow depressions and on wide upland flats. These soils are nearly level and are somewhat poorly drained. The surface layer is dark gray silt loam, and the subsoil is very dark grayish brown and dark grayish brown silty clay in the upper part and light brownish gray silty clay loam in the lower part. The underlying material, at a depth of about 40 inches, is light gray, calcareous silt loam.

The minor soils in the association include Fillmore, Hobbs, Holder, Kezan, Scott, and Uly soils. Fillmore soils are in upland depressions. They are poorly drained and are ponded for short periods. Hobbs soils are nearly level and are on bottom lands adjacent to upland drains. Holder soils are on nearly level ridgetops and broad upland divides near the Platte River breaks. They are well drained. Kezan soils are nearly level and are poorly drained. They are on bottom lands adjacent to upland drains and streams. Scott soils are nearly level and are very poorly drained. They are in upland depressions that are frequently ponded. Uly soils are moderately steep to steep and are well drained. They are on side slopes bordering upland drains.

Farms range from about 200 to 700 acres in size. They mainly are cash-grain farms or combine cash-grain farming and livestock production. Nearly all of the acreage of this soil association is cultivated (fig. 6), and both dryland and irrigation management are used. Corn, grain sorghum, and soybeans are the main cultivated crops. In a few small areas, the soils are in pasture.

Limited precipitation is the main limiting factor under dryland management. Soil blowing may be a hazard on nearly level soils unless the surface is adequately protected. On the steeper soils, water erosion is the major hazard. Maintaining fertility and managing irrigation

Figure 6.—Typical area in the Hastings-Butler association. The soils are used mainly as cropland.

water are the main concerns in irrigated areas.

Gravel roads are on nearly all section lines, and some paved highways cross the association. Farm produce generally is marketed within the county or in adjacent counties.

12. Butler-Hastings association

Nearly level to gently sloping, somewhat poorly drained and well drained silty soils that formed in loess; on uplands

This soil association consists mainly of nearly level to gently sloping soils on uplands and in depressions where water sometimes ponds after rains. The soils are on a broad loess plain.

This soil association covers about 18,230 acres, making up about 5 percent of the county. Butler soils make up about 48 percent of this association and Hastings soils about 38 percent. The remaining 14 percent is minor soils.

Butler soils are in shallow depressions and broad flats on uplands. These soils are nearly level and are somewhat poorly drained. The surface layer is dark gray silt loam. The upper part of the subsoil is very dark grayish brown silty clay, the middle part is dark grayish brown silty clay, and the lower part is light brownish gray silty clay loam. The underlying material, at a depth of about 40 inches, is light gray, calcareous silt loam.

Hastings soils are in broad areas on loess-mantled uplands. These soils are nearly level to gently sloping and are well drained. The surface layer is grayish brown silt loam in the upper part and dark grayish brown silty clay loam in the lower part. The subsoil is dark grayish brown silty clay loam in the upper part and pale brown silty clay loam in the lower part. The underlying material, at a depth of about 40 inches, is light yellowish brown silty clay loam in the upper part and very pale brown silt loam in the lower part.

The minor soils in this association include Fillmore, Hobbs, Kezan, Olbut, and Scott soils. Fillmore soils are in upland depressions. They are poorly drained and are ponded for short periods. Hobbs soils are nearly level and are on bottom lands adjacent to upland drains. Kezan soils are nearly level and are poorly drained. They are adjacent to upland drains. Scott soils are nearly level and are very poorly drained. They are in upland depressions that are frequently ponded.

Farms, on the average, are about 480 acres in size. They generally are cash-grain farms or combine cash-grain farming and livestock raising. Nearly all of the acreage of this association is cultivated, and both dryland and irrigation management are used. Corn, grain sorghum, wheat, and soybeans are the main cultivated crops. In a very few small areas, the soils are in pasture.

Limited precipitation is the main limiting factor on soils under dryland management. Soil blowing may be a hazard on the nearly level soils unless the surface is adequately protected. Maintaining fertility, managing irrigation water, and improving drainage in depressional areas are the main concerns in management.

Gravel roads are on nearly all section lines, and some paved highways cross this association. Farm produce usually is marketed within the county or in adjacent counties.

Silty and loamy soils on uplands

The soils in this group make up about 9 percent of the county. The soils are nearly level to very steep and are well drained to excessively drained. Most of the acreage is dry-farmed, but in many areas the steeper soils are used as rangeland or pasture. Water erosion is the major hazard. Reducing soil losses, conserving moisture, and maintaining fertility are the main concerns in management.

13. Sharpsburg-Steinauer-Pawnee association

Gently sloping to very steep, moderately well drained to excessively drained silty and loamy soils that formed in loess and glacial till on uplands

This soil association consists of gently sloping to very steep soils on uplands (fig. 7). The parent materials of these soils are loess and glacial till. The loess is mainly on gently sloping ridgetops and the upper part of the slopes. The glacial till is mainly on the middle and lower parts of the slopes. The drainage pattern extends to all parts of this association. The largest streams are North Oak Creek, Middle Oak Creek, and Oak Creek.

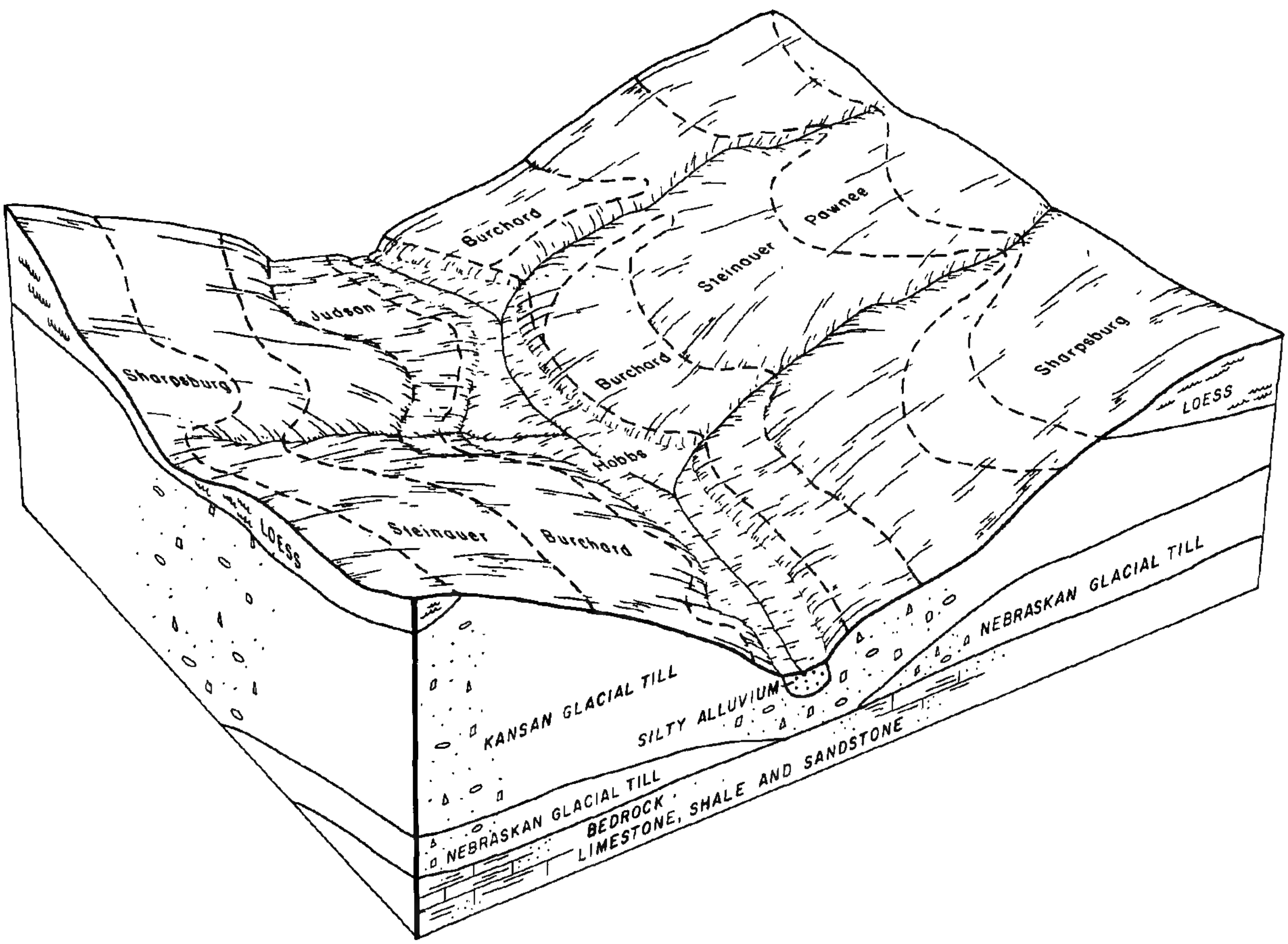

Figure 7.—Typical pattern of soils in the Sharpsburg-Steinauer-Pawnee association and relationship of the soils to topography and parent material.

This soil association covers about 32,465 acres, making up about 9 percent of the county. Sharpsburg soils make up about 19 percent of this association, Steinauer soils about 16 percent, and Pawnee soils about 15 percent. The remaining 50 percent is minor soils.

Sharpsburg soils are gently sloping to strongly sloping, and they are moderately well drained. These soils are on loess-mantled ridgetops and the upper part of side slopes (fig. 8). The surface layer is dark gray silty clay loam. The subsoil ranges from dark grayish brown silty clay loam in the upper part to light yellowish brown silty clay loam in the lower part. The underlying material, at a depth of 46 inches, is very pale brown silt loam.

Steinauer soils are strongly sloping to very steep, and they are well drained to excessively drained. These soils are on middle and lower slopes adjacent to gullies. The surface layer is dark gray clay loam, and the transition layer is calcareous, grayish brown clay loam. The underlying material, at a depth of about 18 inches, is calcareous, pale brown and light gray clay loam. Rocks and pebbles are common on the surface, and there are commonly pebbles and rocks throughout these soils.

Pawnee soils formed in till. They are on upland slopes below the loess-mantled areas of Sharpsburg soils. These soils are gently to strongly sloping, and they are well drained. They have a surface layer of dark grayish brown and dark gray clay loam. The subsoil is grayish brown clay in the upper part, brown and yellowish brown clay in the middle part, and light yellowish brown clay loam in the lower part. The underlying material, at a depth of 45 inches, is calcareous, pale yellow clay loam. There are a few pebbles throughout the subsoil and underlying material.

The minor soils in this association include Burchard, Hobbs, Judson, Longford, and Ponca soils. Burchard soils are strongly sloping to moderately steep. Hobbs soils are nearly level and are on occasionally flooded bottom lands of upland drains. Judson soils are gently sloping and are on foot slopes of the uplands. Longford soils are gently to strongly sloping and are on upper side

Figure 8.—Typical landscape of Sharpsburg soils in the Sharpsburg-Steinauer-Pawnee association.

slopes and low ridgetops. Ponca soils are on narrow ridgetops and on upper side slopes on loess-mantled uplands.

Farms generally are about 240 to 400 acres in size. They generally combine cash-grain farming and livestock production. Corn, soybeans, grain sorghum, and alfalfa are the main crops. Most of the acreage is under dryland management because of the steepness of slopes and the low productivity of some of the soils. Most soils on the steeper slopes are used as permanent pasture.

Controlling erosion and maintaining fertility are the main concerns in management. If the soils are cultivated, conservation practices are necessary if sheet and gully erosion are to be controlled. Maintaining good tilth is also a concern.

Gravel or improved dirt roads are on most section lines. Farm produce is marketed in the county or in adjacent counties.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Hastings silt loam, 1 to 3 percent slopes, is one of several phases in the Hastings series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Inavale-Boel complex, 0 to 6 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

Af—Alda fine sandy loam, 0 to 2 percent slopes. This is a nearly level, somewhat poorly drained soil that is moderately deep over coarse sand. It is on bottom lands along the Platte River and is occasionally flooded. Areas are elongated and range from 5 to 100 acres in size.

Typically, the surface layer is friable fine sandy loam about 14 inches thick. It is dark gray in the upper part and gray in the lower part. The underlying material to a depth of 26 inches is light gray fine sandy loam. Below that, to a depth of 60 inches it is light gray coarse sand. In a few areas, the surface layer is loam.

Included in mapping are small areas of the somewhat excessively drained Inavale soils in higher positions on the landscape. These included soils make up about 3 to 8 percent of the map unit.

Permeability is moderately rapid in the surface layer and very rapid in the underlying material. The available water capacity is moderate or low. Runoff is slow. The seasonal high water table ranges from a depth of about 2 feet in wet years to a depth of about 3 feet in dry years. The water table generally is highest in winter and spring. The content of organic matter is moderately low, and natural fertility is medium. The water intake rate is moderately high. This soil releases moisture readily to plants. The surface layer is easily tilled within a wide range of moisture content. Reaction is mildly or moderately alkaline throughout.

About half of the acreage is under cultivation. The rest is in native grasses that are used for grazing or mowed for hay.

Under dryland management, this soil is best suited to wheat and other close-growing crops. The soil is wet in spring, and tillage generally is delayed. Later in the

growing season, the water table drops and the soil becomes droughty. As a result, the soil is not well suited to row crops. Conservation practices, for example, stripcropping, minimum tillage, and stubble mulching, help to control soil blowing. Cover crops also help to control soil blowing. Returning crop residue to the soil increases the content of organic matter and helps to maintain or improve fertility.

If this soil is irrigated, it is suited to corn, grain sorghum, wheat, tame grasses, and alfalfa. It is poorly suited to gravity irrigation because of the moderately rapid and very rapid permeability, but it is suited to sprinkler irrigation. Water should be applied frequently and in small amounts. Tillage commonly is delayed in spring. Soil blowing is the main concern in management. Returning crop residue to the soil helps to maintain or improve fertility and increases the content of organic matter. Using commercial fertilizers also helps to improve or maintain fertility.

Using this soil as rangeland is effective in controlling soil blowing. Overgrazing or improper haying methods reduce the protective cover and cause the potential natural vegetation to deteriorate. Proper grazing use and timely deferment of grazing or haying, as well as restricted grazing in very wet periods, help to maintain the plant community in good condition.

This soil is suited to those trees and shrubs that tolerate a high water table and occasional flooding. Grasses and weeds compete with the young trees for moisture and sunlight. Cultivating between the tree rows and applying selective herbicides help to control weeds.

This soil generally is not suited to septic tank absorption fields because of the seasonal high water table, flooding, and the poor filtering capacity of the soil. This soil generally is not suited to use as building sites because of flooding and the seasonal high water table. Flood damage to roads can be reduced by constructing them on raised and compacted fill material and providing adequate side ditches and culverts. Damage to roads caused by frost action can be reduced by surface drainage and by a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is assigned to capability units IIIw-6, dryland, and IIIw-9, irrigated. It is in Subirrigated range site and in windbreak suitability group 2.

Ba—Barney loam, 0 to 2 percent slopes. This is a nearly level, poorly drained soil that is shallow over fine sand. It is on bottom lands of the Platte River and is frequently flooded. Areas are long and narrow and commonly are adjacent to the Platte River. They range from 7 to 30 acres in size.

Typically, the surface layer is grayish brown, friable loam about 7 inches thick. The underlying material to a depth of about 60 inches is light gray and gray fine sand.

Included in some areas are river channels that are lower than the surrounding landscape. These included areas make up less than 10 percent of the map unit.

Permeability is moderately rapid in the surface layer and very rapid in the underlying material. The available water capacity is low. Runoff is very slow. This soil has a seasonal high water table that fluctuates between the soil surface and a depth of 2 feet. The content of organic matter is moderate, and natural fertility is low. Reaction is mildly alkaline or neutral throughout.

In most areas, this soil is under a cover of cottonwood trees and brush understory. This soil is not suited to cultivated crops. In some areas, the soil is used as pasture, but grasses generally grow poorly because of the dense shade. Where the trees and brush have been cleared, the grasses are more productive.

This soil is poorly suited to most recreation uses because of the hazard of frequent flooding and the seasonal high water table. In many places, this soil is used as sites for summer cabins because of the nearness of the Platte River. Recreation facilities can be constructed on suitable fill material to help protect them from flooding and wetness.

This soil is not suited to use as sites for buildings or sanitary facilities because of frequent flooding and the seasonal high water table. This soil is a poor filter, and contamination of the ground water is a hazard. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help to protect roads from flood damage and wetness.

This soil is assigned to capability unit Vw-7, dryland. No range site is assigned. This soil is in windbreak suitability group 10.

Bd—Blendon fine sandy loam, 0 to 2 percent slopes. This is a nearly level, well drained soil on terraces of the Platte River. Areas are elongated and irregular in shape. They range from 7 to 40 acres in size.

Typically, the surface layer is dark grayish brown, friable fine sandy loam about 8 inches thick. The subsurface layer is dark grayish brown, friable fine sandy loam about 18 inches thick. The subsoil is about 18 inches thick. It is dark grayish brown, friable fine sandy loam in the upper part and brown, very friable fine sandy loam in the lower part. The underlying material to a depth of 60 inches is light yellowish brown loamy sand. In a few small areas, the surface layer is loam.

Included in mapping are areas where the soil has a subsoil of silt loam. This soil is on the lower part of the landscape in swales. It makes up about 10 percent of this map unit.

Permeability is moderately rapid in the surface layer and subsoil and rapid in the lower part of the underlying material. The available water capacity is moderate. Runoff is slow. This soil tends to be somewhat droughty because its water-holding capacity is moderate. The content of organic matter is moderate, and natural

fertility is medium. The water intake rate is moderately high. This soil releases moisture readily to plants. This soil is easily tilled within a wide range of moisture content. Reaction is neutral throughout.

This soil is mainly in cultivated crops. Under dryland management, this soil is suited to grain sorghum, corn, and wheat. The main limitation is droughtiness, and soil blowing is the main hazard. Conservation tillage practices, for example, stripcropping, minimum tillage, and stubble mulching, help to prevent soil blowing. A cover crop is also helpful. Returning crop residue to the soil helps to maintain and improve the content of organic matter and fertility.

Under irrigation, this soil is suited to corn, soybeans, and alfalfa. The main concern in management is the hazard of soil blowing. Keeping as much crop residue as possible on the surface by using minimum tillage and stubble mulching helps to control soil blowing. Returning crop residue to the soil and applying fertilizer help to maintain fertility.

This soil is suited to grasses. Overgrazing or improper haying methods reduce the protective cover and cause the plant community to deteriorate. A grass cover is highly effective in controlling erosion. Proper stocking, rotation grazing, and fertilizing with nitrogen help to maintain maximum yields and to keep the grasses in good condition. Timely mowing reduces weed competition.

This soil is suited to trees and shrubs. Undesirable grasses and weeds are a concern in windbreaks, because they compete with the young trees for moisture and light. Weeds can be controlled by cultivating between the rows and by using selective herbicides. A cover crop between the tree rows helps to reduce soil blowing.

This soil is suited to most engineering uses. Septic tank absorption fields function satisfactorily, but nearby water supplies, streams, ponds, lakes, or watercourses may receive seepage from the absorption field. Seepage is a severe problem if this soil is used for sewage lagoons. The lagoons need to be lined or sealed. There are few problems for building site developments, but walls of shallow excavations tend to cave in. Shoring is needed, or cutbanks need to be sloped to provide stability. This soil provides good road base material.

This soil is assigned to capability units IIs-6, dryland, and IIs-8, irrigated. It is in Sandy range site and in windbreak suitability group 5.

BdC—Blendon fine sandy loam, 2 to 6 percent slopes. This is a deep, well drained soil on gentle slopes that separate different levels of terraces along the Platte River. Areas are elongated and irregular in shape and commonly are parallel to large streams. The areas range from 7 to 200 acres in size.

Typically, the surface layer is very dark gray, very friable fine sandy loam about 17 inches thick. The subsoil is very friable fine sandy loam about 17 inches thick. It is very dark gray in the upper part and dark grayish brown in the lower part. The upper part of the underlying material is light brownish gray loamy sand about 14 inches thick, and the lower part to a depth of 60 inches is pale brown fine sand. In some areas, the dark surface layer is thinner than is typical. In some small areas on the lower part of the landscape, the soil is moderately well drained.

Included in mapping are small areas of sandy Thurman soils that are in higher positions. These soils make up about 5 to 10 percent of this map unit.

Permeability is moderately rapid in the surface layer and subsoil and rapid in the lower part of the underlying material. Runoff is slow. The available water capacity is moderate. The water intake rate for irrigation is moderately high. The content of organic matter is moderate, and natural fertility is moderate. Tilth is good.

This soil is almost entirely under cultivation.

Under dryland management, this soil is suited to wheat, grain sorghum, oats, and grasses and legumes. Soil blowing is a hazard if this soil is not adequately protected by crops or crop residue. Conservation tillage practices that leave crop residue on the surface help to prevent soil blowing and to conserve moisture. Returning crop residue to the soil and adding manure help to maintain or improve tilth and fertility.

Under irrigation, this soil is suited to corn, alfalfa, soybeans, and grain sorghum. This soil generally is better suited to sprinkler irrigation because of the slope. Soil blowing is the most serious problem. The same management practices that are used under dryland management to control erosion can be used.

This soil is suited to use as pasture. Wind erosion is the main hazard. Overgrazing and improper haying methods deplete the plant community and increase the risk of erosion. Proper grazing use, timely deferment of grazing or haying, and planned grazing systems help maintain or improve pasture conditions.

This soil is suited to trees in windbreaks. The main concerns in establishing tree seedlings are competition for moisture from weeds and grasses, the hazard of soil blowing, and lack of available moisture. Weeds can be controlled by cultivating between rows with conventional equipment and hoeing or rototilling in the rows. Using appropriate herbicides also helps to control weeds. Cover crops help to control soil blowing. Irrigation can be used in periods of low rainfall.

Septic tank absorption fields function satisfactorily, but care should be taken that seepage does not contaminate the water table. Sewage lagoons need to be lined or sealed to prevent seepage. This soil is suited to use as sites for buildings. The sides of shallow excavations tend to cave in. Shoring is needed, or cutbanks need to be sloped to provide stability. Damage to roads and streets caused by frost action can be reduced by surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is assigned to capability units IIIe-3, dryland, and IIIe-8, irrigated. It is in Sandy range site and in windbreak suitability group 5.

Bf—Blendon-Muir complex, 0 to 2 percent slopes. This map unit consists of nearly level, well drained soils on terraces of the Platte River. The Blendon soil is on the higher part of the landscape, and the Muir soil is on the lower part. The Muir soil is rarely flooded.

The mapped areas are about 55 to 60 percent Blendon soil and 35 to 40 percent Muir soil. These soils are too closely intermingled to be shown separately on the map. The areas are irregular in shape and generally are longer than they are wide. They range from 40 to 200 acres in size.

Typically, the Blendon soil has a surface layer that is dark gray, friable fine sandy loam about 15 inches thick. The subsoil is about 29 inches thick. It is dark grayish brown, friable fine sandy loam in the upper part and brown, very friable fine sandy loam in the lower part. The underlying material to a depth of about 60 inches is light yellowish brown loamy sand. In a few small areas, the surface layer is loam.

Typically, the Muir soil has a surface layer that is very friable, dark grayish brown loam about 14 inches thick. The subsoil is dark grayish brown, very friable loam about 10 inches thick. The underlying material is grayish brown and brown loam in the upper part and grayish brown silt loam in the lower part. In some areas, the surface layer is silt loam and silty clay loam.

Included in mapping are small areas of Thurman soils on the higher part of the landscape. Also included are soils, in an area northeast of Octavia, that have a clayey surface layer and subsoil. These soils are on the lower part of the landscape. The included soils make up 5 to 10 percent of the map unit.

Permeability is moderately rapid in the subsoil and rapid in the underlying material in the Blendon soil. Permeability is moderate in the Muir soil. The available water capacity is moderate in the Blendon soil and high in the Muir soil. Runoff is slow. Natural fertility is medium in the Blendon soil and high in the Muir soil. The content of organic matter is moderate. In both soils, the surface layer is easily tilled within a wide range of moisture content. The water intake rate is moderate for the Muir soil and moderately high for the Blendon soil. These soils release moisture readily to plants.

Almost all of the acreage of this map unit is used for cultivated crops. In a few small areas, the soils are used as pasture.

The soils in this map unit are suited to crops under dryland management. Corn, grain sorghum, wheat, and soybeans are the commonly grown crops. The main problem in management is soil blowing. Conservation practices that include minimum tillage, stripcropping, and stubble mulching help to prevent soil blowing and conserve moisture. Cover crops also help to prevent soil blowing. Returning crop residue to the soil and adding chemical and organic fertilizers help to maintain fertility.

Under irrigation, the soils in this map unit are suited to corn, soybeans, and alfalfa. The main concern in management is soil blowing, but it can be controlled by minimum tillage, stubble mulching, and keeping as much crop residue on the surface as possible. Reducing tillage to a minimum also helps maintain fertility. Sprinkler systems are most suitable for these soils because the surface is uneven.

These soils are suited to use as rangeland and pastureland, but they are seldom used for these purposes because of their value as cropland.

These soils are suited to trees and shrubs in windbreaks. The main concerns in windbreak establishment are soil blowing and competition from undesirable grasses and weeds. Weeds and grasses can be controlled by cultivating between the tree rows and by using selective herbicides. Soil blowing can be controlled by cover crops between the rows of trees or around the tree belt.

The crops commonly grown on these soils and the potential plant community provide good cover and feed for openland wildlife. The soils in this map unit are suited to most recreation uses.

Septic tank absorption fields function satisfactorily. Care should be taken on the Blendon soil that pollution by seepage does not contaminate the ground water. Sewage lagoons need to be lined or sealed to prevent seepage. Dwellings and buildings on the Muir soil need to be constructed on elevated and well compacted fill material as protection against flooding. Damage to roads and streets caused by frost action can be reduced by surface drainage. Roads and streets on the Muir soil need to be designed so that the pavement and the subbase are thick enough to compensate for the low soil strength. Coarser material, for example, that of the Blendon soil in this map unit, can be used for subgrade or base material to ensure better performance.

This map unit is assigned to capability units IIs-6, dryland, and IIs-8, irrigated. The Blendon soil is in Sandy range site, and the Muir soil is in Silty Lowland range site. The Blendon soil is in windbreak suitability group 5, and the Muir soil is in windbreak suitability group 1.

Bh—Boel loam, 0 to 2 percent slopes. This is a deep, nearly level, somewhat poorly drained soil that is occasionally flooded. It is on bottom lands along the Platte River. Areas are irregular in shape and range from 80 to several hundred acres in size.

Typically, the upper part of the surface layer is very dark gray, firm, calcareous loam about 11 inches thick. The lower part of the surface layer is mixed dark gray and light gray, friable, calcareous silty clay loam about 3 inches thick. The transition layer is light gray, mottled, very friable, calcareous loamy very fine sand about 6 inches thick. The underlying material to a depth of 60 inches is light gray, mottled, calcareous fine sand. In a few areas, the surface layer is thicker.

Included in mapping are small areas of Alda soils in higher positions on the landscape. These soils make up about 5 percent of the map unit.

Permeability is rapid. The available water capacity is low or moderate. The content of organic matter is moderately low, and natural fertility is medium. The seasonal high water table is at a depth of 1.5 to 3.5 feet. The water intake rate is moderately high. The surface layer can be tilled within a fairly wide range of moisture content.

In most areas, this soil is used as rangeland or for hay crops. In a few small areas, the soil is used for cultivated crops.

Under dryland management, this soil is poorly suited to use as cropland. This soil has limitations that make farming difficult. In wet periods, the water table is high, and in dry periods, the soil becomes droughty.

Under irrigation, this soil is suited to corn, grain sorghum, wheat, and tame grasses. Sprinkler irrigation is best suited to this soil because of the rapid permeability. Water should be applied often and in small amounts. Tillage commonly is delayed in spring because of wetness. Conservation tillage practices, for example, minimum tillage, stripcropping, and stubble mulching, help prevent soil blowing. Returning crop residue to the soil helps to maintain fertility and the content of organic matter. Using commercial fertilizers also helps to maintain fertility.

This soil is suited to use as rangeland, either for grazing or for haying. Overgrazing or improper haying methods reduce the protective cover and cause the potential natural vegetation to deteriorate. Overgrazing when this soil is wet can result in surface compaction and the formation of small mounds. Grazing and hay harvesting then become difficult. Proper grazing use and timely deferment of grazing or haying, as well as restricted grazing in wet periods, help to maintain the plant community in good condition.

This soil is suited to those trees and shrubs that tolerate occasional flooding and wetness. Wetness and persistent weeds in summer are the main problems in establishing windbreaks. Weeds can be controlled by cultivating between the rows, hand hoeing or rototilling around trees, and using appropriate herbicides. Drainage helps to cope with wetness.

This soil has good potential for habitat for openland and rangeland wildlife. The main hazard to wildlife is the destruction of habitat, for example, the burning of fence rows, ditchbanks, and crop residue. Preserving and improving existing habitat and establishing new habitat help considerably to increase wildlife populations.

Because of flooding and wetness caused by the seasonal high water table, this soil generally is not suited to septic tank absorption fields, sewage lagoons, and sites for buildings. A substitute site is needed. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help to protect roads against flood damage and wetness.

This soil is in capability units IIIw-1, dryland, and IIIw-3, irrigated. It is in Subirrigated range site and in windbreak suitability group 2.

Bn—Boel-Alda complex, 0 to 2 percent slopes. This map unit consists of nearly level, somewhat poorly drained soils on ridges and in old channels on bottom lands of the Platte River. The Boel soil is in long, narrow old stream channels; the Alda soil is on long, narrow ridges adjacent to the channels. The Boel soil is deep and the Alda soil is moderately deep over coarse sand. The soils are occasionally flooded.

These soils are in areas that are too closely intermingled to be shown separately on the map. The mapped areas are about 50 to 55 percent Boel soil and 40 to 45 percent Alda soil. Generally the areas are longer than they are wide, and they range from 10 to 120 acres in size.

Typically, the Boel soil has a dark gray loam surface layer 8 inches thick. The transition layer is mixed gray and light brownish gray, friable loam about 9 inches thick. The underlying material is light gray fine sand, sand, and coarse sand. In a few areas the surface layer is lighter colored, and in some of these areas it is sandy loam.

Typically, the Alda soil has a friable fine sandy loam surface layer that is dark gray in the upper part and gray in the lower part. The surface layer is about 14 inches thick. The upper part of the underlying material is stratified light gray and light brownish gray, loose fine sandy loam about 12 inches thick. Below that, to a depth of 60 inches it is light gray coarse sand.

Included in mapping and making up 3 to 8 percent of the map unit are small areas of Inavale soils on ridges on the highest parts of the landscape. These soils are somewhat excessively drained.

Permeability is rapid in the Boel soil and moderately rapid over very rapid in the Alda soil. The available water capacity is moderate or low. These soils release moisture readily to plants. The seasonal high water table ranges from a depth of 1.5 to 3.5 feet in the Boel soil and from 2 to 3 feet in the Alda soil. The water intake rate is moderately high. The content of organic matter is moderately low, and natural fertility is medium. The shrink-swell potential is low.

These soils are mainly in native grasses and are used as rangeland or for hay. Most of the acreage in cultivation is irrigated. Because these soils tend to be droughty in the summer, their potential is fair for irrigated crops and poor for dry-farmed crops.

Under dryland management, these soils are suited to corn, grain sorghum, soybeans, wheat, and alfalfa. Soil blowing is a hazard. These soils are often droughty in summer because of the low available water capacity of the sandy underlying material. Conservation tillage practices that return crop residue to the soil add organic material, improve fertility and tilth, and help to reduce soil blowing. Minimum tillage is an example.

Under sprinkler irrigation, these soils are suited to corn, grain sorghum, and alfalfa. These soils are poorly suited to gravity irrigation systems because of the rapid permeability and the undulating topography. Soil blowing is the main problem. Conservation practices that include minimum tillage, stubble mulching, and stripcropping help to control wind erosion and conserve soil moisture by lessening evaporation. Returning crop residue to the soil helps to maintain fertility and the content of organic matter.

The use of these soils as rangeland is an effective way to control wind erosion. These soils can produce large amounts of native grasses. Overgrazing reduces the protective cover and causes the plant community to deteriorate. Proper distribution of livestock is important for efficient use of rangeland. It can be achieved by correctly locating fences, salting facilities, and watering places.

These soils are suited to those trees and shrubs that tolerate sandy soils and droughty conditions. Lack of moisture and the severe hazard of soil blowing are the main concerns in establishing windbreaks. Weeds are highly competitive for moisture and can be controlled by cultivating between trees and using selective herbicides. Cover crops can be planted between rows of trees or in strips next to the windbreak to control soil blowing. Young trees need to be protected from livestock.

These soils have good potential for the establishment of habitat for openland wildlife. The native plant community furnishes food and cover for game birds and other birds and animals.

Because of flooding and wetness caused by the seasonal high water table, these soils generally are not suited to septic tank absorption fields, sewage lagoons, and sites for buildings. A substitute site is needed for these uses. Seepage from septic tank absorption fields is an additional concern because it can contaminate ground water. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help to protect roads against flood damage and wetness. Damage to roads caused by frost action can be reduced by providing good surface drainage and by placing a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

These soils are assigned to capability units IIIw-5, dryland, and IIIw-9, irrigated. They are in Subirrigated range site and in windbreak suitability group 2.

Br—Brocksburg sandy loam, 0 to 2 percent slopes. This is a nearly level, well drained soil that is moderately deep over sand. It is on the slightly higher parts of broad stream terraces. Areas are irregular in shape and range from 40 to several hundred acres in size.

Typically, the surface layer is dark gray, very friable sandy loam about 12 inches thick. The subsurface layer is very dark gray loam about 7 inches thick. The subsoil is dark grayish brown, friable loam in the upper part and brown, friable clay loam in the lower part. The underlying material to a depth of 60 inches is yellowish brown sand in the upper part and light yellowish brown, loose sand in the lower part.

Included in mapping are small areas of soils that are loamy sand to a depth of about 40 inches and loamy material below that. These soils generally are in higher positions. Also included are small areas of sandy Simeon soils in lower positions. The included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil and very rapid in the underlying sand. Runoff is slow. The available water capacity is moderate or low, and the water intake rate is high. Effective rooting depth is about 32 to 40 inches over sand. The content of organic matter is moderately low, and natural fertility is medium. This soil is easily tilled within a wide range of moisture content. In cut areas where the land has been leveled, the content of organic matter may be low and fertility may be poor.

This soil is mainly used for irrigated crops. In a few small areas, the soil is used as rangeland.

This soil is poorly suited to dryland farming because of droughtiness. Wind erosion is the major hazard. Minimum tillage and cover crops help to control soil blowing. Wheat and grain sorghum can be grown. Returning crop residue to the soil helps to increase the content of organic matter and to improve fertility.

This soil is suited to irrigated crops. Under irrigation, corn, wheat, and grain sorghum can be grown. A sprinkler irrigation system is most suitable because of the very rapid permeability of the underlying sand. Wind erosion is the main hazard. Timely irrigation, minimum tillage, stubble mulching, and cover crops help to reduce soil blowing. Spreading barnyard manure and returning crop residue to the soil help to improve fertility.

Using this soil as rangeland is very effective in controlling soil blowing. Overgrazing reduces the protective cover and causes the potential native plant community to deteriorate. Proper grazing use, timely deferment of grazing, and a planned grazing system help to maintain or improve the range condition.

This soil is poorly suited to trees and shrubs in windbreaks. Droughtiness, competition from weeds and grasses, and soil blowing are the main concerns in establishing windbreaks. Irrigating in periods of insufficient rainfall helps to overcome droughtiness. Cultivating between rows, hand hoeing, and using appropriate herbicides help to control weeds. Using herbicides, however, may not be practical because of the possibility of leaching. Cover crops help to reduce soil blowing. Seedlings and young trees need to be protected from livestock.

Septic tank absorption fields function satisfactorily, but care should be taken that pollution by seepage does not contaminate the ground water. Sewage lagoons need to be lined or sealed to prevent seepage. Foundations for dwellings without basements and commercial buildings

need to be strengthened and backfilled with coarse material to prevent damage caused by the moderate shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser material can be used for subgrade or base material to ensure better performance.

This soil is assigned to capability units IVs-6, dryland, and IIIs-9, irrigated. It is in Sandy range site and in windbreak suitability group 6G.

BsD—Burchard loam, 6 to 11 percent slopes. This is a deep, strongly sloping, well drained soil along upland intermittent drainageways on lower slopes that are somewhat concave. Areas generally are long and narrow. They range from 10 to 30 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 9 inches thick. The subsoil is 28 inches thick. It is friable clay loam throughout and grades from dark grayish brown in the upper part to yellowish brown in the lower part. The underlying till material to a depth of about 60 inches is light yellowish brown clay loam in the upper part and light gray clay loam in the lower part. It has many large lime segregations. In a few areas, the surface layer is thicker, and the depth to lime is greater.

Included in mapping are small areas of Judson soils at the bottom of drainageways and Steinauer soils on convex upper slopes. The included soils make up about 10 percent of the map unit.

Permeability is moderately slow, the available water capacity is high, and runoff is rapid. The water intake rate is low. Reaction is neutral in the surface layer and the upper part of the subsoil and moderately alkaline below that. Natural fertility is medium, and the content of organic matter is moderate. The surface layer is easily tilled within a wide range of moisture content.

About half of the acreage of this soil is under cultivation. The rest is used as pasture or rangeland.

Under dryland management, this soil is suited to row crops, small grains, and legumes. If this soil is used for cultivated crops, erosion is a hazard. Sheet erosion and formation of gullies can occur. Conservation practices that include minimum tillage, contour farming, and terracing on smooth slopes help to prevent excessive soil loss. Returning crop residue to the soil and systematically adding organic matter help to improve fertility and tilth and to reduce erosion.

This soil is poorly suited to gravity irrigation because of the slope. Using a sprinkler irrigation system reduces the need for excessive cuts in land leveling and increases the efficiency of water use. Under irrigation, this soil is better suited to close-growing crops than to row crops, because water erosion is easier to control in close-growing crops.

This soil is suited to use as pasture. Properly managed grassland or grass and legume pasture is effective in preventing erosion. Poor management, for example, overgrazing, results in compaction, poor tilth, excessive runoff, and erosion. Erosion can cause the formation of gullies and rills.

Using this soil as rangeland is highly effective in controlling soil blowing and water erosion. Overgrazing, however, reduces the protective plant cover and causes the plant community to deteriorate. Proper stocking and a planned grazing system help to keep the grasses in good condition.

This soil is suited to trees and shrubs in windbreaks. It has good potential for native trees, coniferous plants, and shrubs. Water erosion is a hazard. Competition for moisture from grasses and weeds is the main concern in establishing seedlings. Planting trees on the contour and cover crops between the rows helps to reduce erosion. Using selective herbicides and cultivating between the trees help to control grasses and weeds. Seedlings and young trees need to be protected from livestock.

This soil has good potential as habitat for openland and rangeland wildlife. The main threat to wildlife on this soil is the destruction of habitat, for example, by unjustified burning of fence rows, ditchbanks, and crop residue. Protecting waste areas, preserving and improving other existing habitat, and establishing new habitat help considerably to increase wildlife populations.

The moderately slow permeability of this soil is a limitation for septic tank absorption fields. This limitation can generally be overcome by increasing the size of the field. Using this soil for sewage lagoons requires extensive grading to modify the slope and shape the lagoon. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage caused by the moderate shrinking and swelling of the soil. Roads and streets need to be designed so that the surface pavement and subbase are thick enough to compensate for the low soil strength. Coarser material can be used for subgrade or base material to ensure better performance.

This soil is assigned to capability units IIIe-1, dryland, and IVe-4, irrigated. It is in Silty range site and in windbreak suitability group 3.

BsE—Burchard loam, 11 to 15 percent slopes. This a moderately steep, well drained soil along intermittent drainageways on uplands and on slopes that are long and somewhat concave. Areas generally are long and fairly broad. They range from 15 to 45 acres in size.

Typically, the surface layer is very dark gray, friable loam about 12 inches thick. The upper part of the subsoil is brown, friable clay loam about 13 inches thick. The lower part of the subsoil is brown, friable, calcareous clay loam about 7 inches thick. The underlying material to a depth of 60 inches is mixed light brownish gray and light gray, mottled clay loam. There are a few small pebbles and stones throughout the soil.

Included in mapping and making up less than 5 percent of the map unit are a few areas of Steinauer soils on the more convex upper part of slopes.

Permeability is moderately slow. The available water capacity is high, and runoff is rapid. The water intake rate is low. Reaction is neutral in the surface layer and the upper part of the subsoil and moderately alkaline in the lower part and the underlying material. Natural fertility is medium, and the content of organic matter is moderate. The surface layer is easily tilled within a wide range of moisture content.

This soil is mainly used as rangeland. In a few small areas, the soil is in crops.

This soil is poorly suited to cultivated crops under dryland management. If this soil is cultivated, water erosion is a problem. Grassed waterways and conservation practices, for example, minimum tillage and residue management, help to reduce soil loss. Smooth slopes can be terraced and farmed on the contour. Returning crop residue to the soil and adding organic fertilizer regularly help to maintain or improve fertility and tilth.

This soil generally is not irrigated because of the moderately steep slopes and the high hazard of water erosion.

Using this soil as rangeland is highly effective in controlling soil blowing and water erosion. Overgrazing, however, reduces the protective plant cover and causes the plant community to deteriorate. Proper stocking and a planned grazing system help to keep the grasses in good condition.

This soil is suited to trees and shrubs in windbreaks. It has good potential for native trees, coniferous plants, and shrubs. Water erosion is a hazard. Competition for moisture from grasses and weeds is the main concern in establishing seedlings. Planting trees on the contour and cover crops between rows helps reduce erosion. Using selective herbicides and cultivating between the trees can control grasses and weeds, which may choke out seedlings. Seedlings and young trees need to be protected from livestock.

This soil has good potential as habitat for openland and rangeland wildlife. The main problem for wildlife is the lack of habitat. Establishing new habitat and improving existing habitat help considerably to increase wildlife populations.

The moderately slow permeability is a limitation for septic tank absorption fields. This limitation can generally be overcome by increasing the size of the absorption field. Land shaping and installing the distribution lines across the slope generally are necessary for proper operation of the field. Use of this soil for sewage lagoons requires extensive grading to modify the slope and shape the lagoon. Houses and small commercial buildings need to be properly designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage caused by the moderate shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for low soil strength. Coarser material can be used for subgrade or base material to ensure better performance.

This soil is assigned to capability unit IVe-1, dryland. It is in Silty range site and in windbreak suitability group 3.

BtE2—Burchard-Steinauer clay loams, 11 to 15 percent slopes, eroded. This map unit consists of deep, moderately steep, well drained soils on side slopes of uplands. The Burchard soil is on concave slopes and along the upper part of drainageways. The Steinauer soil is on more convex slopes. Erosion has removed most of the surface layer of these soils. Where the Steinauer soil is under cultivation, the remaining surface layer is mixed with the subsoil or underlying material during tillage.

These soils are in areas that are too closely intermingled to be mapped separately. The mapped areas are about 50 percent Burchard soil and about 45 percent Steinauer soil. They are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer of the Burchard soil is dark grayish brown, friable clay loam about 7 inches thick. The upper part of the subsoil is brown, friable clay loam about 10 inches thick. The lower part of the subsoil is pale brown, friable, calcareous clay loam about 8 inches thick. The underlying material is light gray, calcareous clay loam that has common coarse prominent yellowish brown mottles. There are small pebbles and stones throughout.

Typically, the surface layer of the Steinauer soil is pale brown, friable, calcareous clay loam about 7 inches thick. The transition layer is pale brown, friable, calcareous clay loam that has few fine prominent strong brown mottles. The underlying material is light gray, calcareous clay loam that has many medium prominent strong brown mottles. There are small pebbles and stones throughout.

Included in mapping and making up about 5 percent of the map unit are a few small areas of Pawnee soils on the upper part of side slopes.

Permeability is moderately slow. The available water capacity is high. The water intake rate for irrigation is low, and runoff is rapid. The content of organic matter is moderate in the Burchard soil and low in the Steinauer soil. Natural fertility is medium in the Burchard soil and low in the Steinauer soil. Tilth of both soils is fair. The Steinauer soil generally is low in phosphorus because of the high content of calcium carbonate. It commonly has a few pebbles and small stones on the surface.

About half of the acreage of this map unit is under cultivation. The rest is used as rangeland or pasture.

These soils are poorly suited to use as dry-farmed cropland. If crops are grown, wheat, alfalfa, grasses, and other close-growing crops that cover the soil and help reduce erosion are most suitable. Erosion is the main concern in management. Conservation tillage methods that include stubble mulching, terracing, and grassed

waterways help to reduce erosion. Returning crop residue to the soil and adding barnyard manure help to improve fertility and tilth and to increase the content of organic matter. The use of phosphate fertilizer generally increases yields.

The soils generally are not used for irrigated crops because of the steepness of slopes and the severe hazard of water erosion.

These soils are suited to use as rangeland. This use is effective in controlling water erosion. Overgrazing or improper haying methods reduce the protective cover and cause the potential plant community to deteriorate. Overgrazing can result in severe soil loss by water erosion. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to maintain or improve the range condition.

These soils are suited to conifers and other trees and shrubs in windbreaks. Water erosion and plant competition are concerns in establishing seedlings. Planting trees on the contour and a cover crop between the rows help to reduce erosion. Undesirable grasses and weeds can be controlled by careful use of selective herbicides and by cultivating between the rows. Seedlings and young trees need to be protected from livestock. The Steinauer soil is suited to only those trees and shrubs that tolerate a high content of calcium carbonate in the soil.

These soils have good potential as habitat for rangeland and openland wildlife. Preserving and improving existing habitat and establishing new habitat help considerably to increase wildlife populations.

The moderately slow permeability is a limitation for septic tank absorption fields, but this limitation generally can be overcome by increasing the size of the field. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. Dwellings and small commercial buildings need to be properly designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage caused by the moderate shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material for better performance.

These soils are assigned to capability unit IVe-8, dryland. The Burchard soil is in Silty range site, and the Steinauer soil is in Limy Upland range site. The Burchard soil is in windbreak suitability group 3, and the Steinauer soil is in windbreak suitability group 8.

Bu—Butler silt loam, 0 to 1 percent slopes. This is a deep, nearly level, somewhat poorly drained soil in very shallow depressions and slight swales on broad upland divides and terraces of the Big Blue River. Most areas are somewhat long and oblong. They range from 8 acres to about 400 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 14 inches thick. The upper part of the subsoil is very dark grayish brown, very firm silty clay about 10 inches thick. The middle part of the subsoil is dark grayish brown, very firm, silty clay that has yellowish brown mottles and is about 11 inches thick. The lower part of the subsoil is light brownish gray, friable silty clay loam that has strong brown mottles and is about 5 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silt loam that has strong brown mottles.

Included in mapping are small areas of poorly drained, occasionally ponded Fillmore soils in depressions. Also included are small areas of well drained Hastings soils in slightly higher positions. The included soils make up about 10 percent of the map unit.

Because there is a claypan in the subsoil, permeability is slow. Runoff is slow. The available water capacity is high. Reaction is slightly acid in the surface layer, neutral in the subsoil, and mildly alkaline in the lower part of the underlying material. Natural fertility is high, and the content of organic matter is moderate. The water intake rate for irrigation is low. Tilth is fair. The perched seasonal high water table is at a depth of 6 inches to 3 feet.

This soil is mainly under cultivation. In a few small areas, it is used as pasture.

Under dryland management, this soil is suited to corn, grain sorghum, soybeans, and wheat. Surface wetness commonly delays spring planting and sometimes damages growing crops. Wetness sometimes delays cultivation of row crops, leading in turn to inordinate growth of weeds that compete with the crop plants. Providing drainage and shaping the land to a suitable gradient help to control wetness.

This soil is suited to irrigated cropping systems. The main problems under irrigation are wetness and slow permeability. Surface drainage is desirable on this soil to reduce damage to the soil and crops from ponding. This soil has a low water intake rate; therefore, water should be applied in small amounts and at frequent intervals.

This soil is suited to use as pasture and hayland. Cool-season grasses and legumes that can withstand occasional ponding are best for planting on this soil. In years of abnormally high rainfall, alfalfa may drown out. Lime is needed for good yields of alfalfa. When this soil is wet, deferment of grazing helps prevent surface compaction and helps maintain the health of the plant community.

This soil is suited to those trees and shrubs that tolerate wetness. Wetness, abundant and persistent weeds, and cracking in summer because of the shrinking and swelling of the soil are the main problems in establishing windbreaks. Providing drainage helps to cope with wetness. Weeds can be controlled by cultivating between the rows with conventional equipment, hand hoeing or rototilling around trees, and using appropriate herbicides. Soil cracking allows air to

dry out roots of newly established seedlings. Cracking can be controlled by supplemental irrigation and light cultivation.

This soil generally is not suited to use as septic tank absorption fields because of the slow permeability and the seasonal high water table. A substitute site is needed for this use. This soil is poorly suited to sewage lagoons because of the seasonal high water table. Lagoons need to be lined to prevent seepage and to keep the water table from entering the lagoon.

This soil is poorly suited to use as building sites because of wetness and the high shrink-swell potential in the clay subsoil. Roads and streets need to be designed so that the pavement and the subbase are thick enough to provide sufficient strength to compensate for the low strength of the soil. Coarser grained material can be used for subgrade or base material to ensure better performance. Damage to roads caused by frost action can be reduced by surface drainage and by a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is assigned to capability units IIw-2, dryland, and IIw-2, irrigated. It is in Clayey range site and windbreak suitability group 2S.

CfG—Coly silt loam, 30 to 60 percent slopes. This is a deep, very steep, excessively drained soil on side slopes of abrupt breaks and bluffs bordering upland drainageways. Areas generally are long and narrow and range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 5 inches thick. The transition layer is grayish brown, friable silt loam about 4 inches thick. The underlying material to a depth of about 60 inches is pale brown, calcareous silt loam.

Included in mapping are small areas of Coly soils that have slopes of less than 30 percent, small areas of Hobbs soils along the drains, and small areas of less steep Uly soils on concave slopes. These soils make up about 10 percent of the map unit.

Permeability is moderate. The available water capacity is high. Runoff is rapid. The content of organic matter is low, and natural fertility is low.

This soil is mainly used as rangeland. This soil is not suited to cultivated crops or to trees and shrubs in windbreaks. It is too steep to be successfully tilled or planted.

Using this soil as rangeland is effective in controlling soil blowing and water erosion. Overgrazing, however, reduces the protective plant cover and causes the plant community to deteriorate. Proper stocking and a planned grazing system help keep the grasses in good condition.

This soil is not suited to most engineering uses. It is too steep for use as building sites or for installation of sanitary facilities. Construction of roads or streets across these areas generally requires deep landfills or bridges. Modification of the soil material is needed to compensate for low soil strength.

This soil is assigned to capability unit VIIe-9, dryland. It is in Thin Loess range site and in windbreak suitability group 10.

CoB—Cozad silt loam, 1 to 3 percent slopes. This is a well drained, very gently sloping soil on foot slopes and terraces of the Platte River. The soil is rarely flooded. It is in slightly higher positions than the surrounding soils. Areas are irregular in shape and range from 10 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam to a depth of about 7 inches. The subsurface layer is dark grayish brown, friable silt loam about 5 inches thick. The subsoil is 17 inches thick; in the upper part it is grayish brown, friable silt loam, and in the lower part it is pale brown, friable silt loam. The underlying material to a depth of about 60 inches is very fine sandy loam that is pale brown in the upper part and very pale brown in the lower part. In a few small areas, the surface layer is very fine sandy loam.

Included in mapping are small areas of Hobbs and Muir soils in slightly lower positions on the landscape. Hobbs soils formed in older, stratified material. Muir soils have a slightly darker surface layer. The included soils make up 5 to 10 percent of the map unit.

Permeability is moderate. The available water capacity is high. Runoff is moderate. The content of organic matter is moderate, and natural fertility is high. This soil releases moisture readily to plants. Tilth is good, and the soil is easily tilled within a wide range of moisture content. The water intake rate of this soil for irrigation is moderate.

This soil is almost entirely used for cultivated crops. Both dryland and irrigation management are used.

Under dryland management, this soil is suited to corn, soybeans, grain sorghum, wheat, and alfalfa. If it is used for cultivated crops, erosion is a hazard. Conservation tillage methods that leave crop residue on or near the surface of the soil, for example, minimum tillage or stubble mulch tillage, help to prevent erosion and also to conserve soil moisture. These practices also help to maintain and improve fertility, tilth, and organic matter content. Using commercial fertilizers helps to maintain high fertility.

In most areas, this soil is irrigated. Under irrigation, it is suited to corn, soybeans, grain sorghum, and alfalfa. Land leveling helps to make the use of irrigation water more efficient. Crops respond well to applications of commercial fertilizers. Conservation tillage practices, for example, minimum tillage, stripcropping, and stubble mulching, help to prevent soil blowing and loss of soil moisture by evaporation.

Very little of the acreage is used as pasture or rangeland. This soil can be seeded to tame grasses for pasture. The main concern in management is overgrazing.

This soil is well suited to trees and shrubs in windbreaks. The main concern in management is preparing a well cultivated plot of ground that is free from weeds, so that they do not compete with the tree seedlings for moisture. Preemergence herbicides help to control weeds.

The hazard of flooding is a limitation for most urban uses. The moderate permeability is a limitation for septic tank absorption fields, but this limitation can be overcome by increasing the size of the absorption field. Houses and commercial buildings can be constructed on elevated and well compacted fill material as protection against flooding. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help to protect the roads from flood damage. Surface drainage helps to prevent damage to roads and streets caused by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is assigned to capability units IIe-1, dryland, and IIe-6, irrigated. It is in Silty Lowland range site and in windbreak suitability group 3.

CrD2—Crofton silt loam, 6 to 11 percent slopes, eroded. This is a deep, strongly sloping, well drained soil on very narrow ridgetops and convex side slopes of the loess uplands. Most of the surface layer has been removed by water erosion. Under cultivation, the remaining surface layer is mixed with the layer below during tillage. Areas are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is pale brown, very friable, calcareous silt loam about 6 inches thick. The next layer is light yellowish brown, very friable, calcareous silt loam that has a few fine prominent strong brown mottles. It is about 7 inches thick. The underlying material to a depth of about 60 inches is very pale brown, calcareous silt loam that has many small prominent strong brown mottles.

Included in mapping are small areas of Monona soils on narrow ridgetops and on less steep and more concave side slopes. These soils make up about 10 percent of the map unit.

Permeability is moderate. Runoff is moderate. The available water capacity is high. The content of organic matter and natural fertility are low. The water intake rate is moderate. Tilth is good. This soil is calcareous throughout.

In most areas, this soil is farmed. In other areas, it is mainly in native grasses.

Under dryland management, this soil is poorly suited to wheat, grain sorghum, soybeans, and legumes. If this soil is used for cultivated crops, water erosion is a hazard. Sheet erosion is common, and rills and gullies form easily. Grassed waterways and conservation practices that include minimum tillage, contour farming, and terracing help to prevent further soil loss. Returning crop residue to the soil and regularly adding organic matter help to improve fertility and tilth and to reduce erosion. This soil commonly is low in phosphorus because of the high content of calcium carbonate. Adding phosphate fertilizer generally increases yields.

This soil is poorly suited to sprinkler irrigation. Water erosion is a very severe hazard. Close-growing crops and crop residue left on the surface help to prevent further soil loss. Minimum tillage, grassed waterways, and terracing are also effective in reducing soil loss. These practices also help to make the use of irrigation water more efficient, to improve fertility, and to maintain the content of organic matter.

This soil is suited to use as rangeland and pasture. Proper management of grassland or grass and legume pasture is effective in preventing erosion. Overgrazing and poor grazing rotations result in compaction, poor tilth, excessive runoff, and erosion. Gullies and rills form as a result of erosion. Proper grazing use, deferred grazing, and rotation grazing are management practices that help to keep the soil and plants in good condition.

This soil is suited to those trees and shrubs that tolerate a high lime content. It has good potential for native trees, coniferous plants, and shrubs. Water erosion is a hazard to the establishment of windbreaks. Competition for moisture from grasses and weeds is the main concern in establishing seedlings. Planting trees on the contour and cover crops between the rows help to reduce erosion. Using selective herbicides and cultivating between the trees help to control grasses and weeds. Seedlings and young trees need to be protected from livestock.

Land shaping and installing septic tank absorption fields on the contour generally are necessary for proper operation of the field. For sewage lagoons, grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Dwellings and small commercial buildings need to be properly designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance.

This soil is assigned to capability units IVe-9, dryland, and IVe-6, irrigated. It is in Limy Upland range site and in windbreak suitability group 8.

CrE2—Crofton silt loam, 11 to 17 percent slopes, eroded. This is a deep, moderately steep, somewhat excessively drained soil on convex side slopes and very narrow ridgetops of the loess uplands. Most of the original surface layer has been removed by water erosion. Small rills are common. Areas are irregular in shape and range from 10 to 150 acres in size.

Typically, the surface layer is grayish brown, friable, calcareous silt loam about 7 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous

silt loam that has a few medium prominent strong brown mottles and contains many fine lime concretions. In some areas, there are no calcium carbonates in the upper 10 inches of the profile.

Included in mapping are areas of Monona soils on narrow ridgetops and on less steep, more concave side slopes. These soils have a thicker surface layer than Crofton soils and make up about 15 percent of the map unit.

Permeability is moderate. Runoff is moderate. The available water capacity is high. The content of organic matter and natural fertility are low. Tilth is good. This soil is calcareous throughout and tends to be low in available phosphorus and iron, because the high content of calcium carbonate makes these elements unavailable to plants.

This soil is mainly under cultivation. In some areas, it is in native grasses.

Under dryland management, this soil is poorly suited to wheat, grain sorghum, and legumes. If this soil is used for cultivated crops, erosion is a hazard. Sheet erosion and formation of gullies are common unless conservation practices are used. Grassed waterways and conservation practices that include minimum tillage, contour farming, and terracing on smooth slopes help to prevent excessive soil loss. Returning crop residue to the soil and regularly adding organic matter help to improve fertility and tilth and to reduce erosion. This soil tends to be low in phosphorus because of its high calcium carbonate content. Adding phosphate fertilizer generally increases crop yields.

This soil is suited to use as pasture. Proper management of grassland or grass and legume pasture is effective in preventing erosion. Overgrazing and poor grazing rotations result in compaction, excessive runoff, and erosion. Gullies and rills form as a result of erosion. Proper grazing use, deferred grazing, and rotation grazing help to keep the soil and plants in good condition.

This soil is poorly suited to trees and shrubs in windbreaks. It has fair potential for native trees, coniferous plants, and shrubs. Only those trees that tolerate a high content of calcium carbonate should be planted. Water erosion is a major hazard. Competition for moisture from grasses and weeds is the main concern in establishing seedlings. Planting trees on the contour and cover crops between the rows help to reduce erosion. Using selective herbicides and cultivating between the trees help to control grasses and weeds. Seedlings need to be protected from livestock.

Land shaping and installing septic tank absorption fields on the contour generally are necessary for proper operation of the field. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. Lagoons need to be lined or sealed to prevent seepage. Houses and small commercial buildings need to be properly designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance.

This soil is assigned to capability unit IVe-9, dryland. It is in Limy Upland range site and in windbreak suitability group 8.

CrF2—Crofton silt loam, 17 to 30 percent slopes, eroded. This is a deep, steep, somewhat excessively drained soil on upland side slopes bordering drainageways, narrow interfluves, and abrupt breaks. Most of the surface layer has been removed by erosion. Small rills and gullies are common. Areas are irregular in shape and range from 8 to 50 acres in size.

Typically, the surface layer is pale brown, very friable, calcareous silt loam about 7 inches thick. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam that has few fine lime segregations.

Included in mapping are small areas of Monona soils on concave lower slopes in more sheltered positions and on very narrow ridgetops. The included soils make up about 10 percent of the map unit.

Permeability is moderate, and runoff is rapid. The content of organic matter and natural fertility are low. The available water capacity is high. This soil is calcareous throughout and tends to be low in available phosphorus.

This soil is mainly used for grazing.

This soil is not suited to cultivated crops because of the steep slopes. In some areas, this soil was formerly cultivated and is now in grasses.

This soil is suited to use as pasture. Properly managed grassland or grass and legume pasture is effective in preventing erosion. Overgrazing, grazing under extremely wet conditions, and poor grazing rotations result in compaction, poor tilth, excessive runoff, and erosion. Gullies and rills form as a result of erosion. Proper stocking and rotation grazing help to keep the soil and plants in good condition.

Using this soil as rangeland is effective in controlling wind and water erosion. Overgrazing reduces the protective cover and causes the potential natural vegetation to deteriorate. It also can result in severe gully erosion. Proper grazing use, timely deferment of grazing, and a planned grazing system help to maintain or improve range conditions.

This soil is not suited to mechanical planting of trees and shrubs in windbreaks because of the steep slopes. An onsite evaluation is needed to determine if planting trees and shrubs by hand is practical in some areas. Only trees and shrubs that tolerate a high lime content should be planted.

This soil is suited to use as habitat for wildlife. The soil supports a variety of plants that provide food and cover for wildlife.

This soil is not suited to sanitary facilities or building site development because of the steep slopes. Cuts and

fills are needed to provide a suitable grade for roads and streets. Roads and streets need to be designed so that the surface pavement and subbase are thick enough to compensate for the low soil strength.

This soil is assigned to capability unit VIe-9, dryland. It is in Limy Upland range site and windbreak suitability group 10.

CrG—Crofton silt loam, 30 to 60 percent slopes. This is a deep, very steep, excessively drained soil on abrupt breaks and on bluffs. Areas are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 11 inches thick. The transition layer is grayish brown, friable silt loam about 6 inches thick. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam in the upper part and very pale brown, calcareous silt loam in the lower part.

Included in mapping are small areas of soils that formed in glacial till and are on the lower part of slopes and small areas of Hobbs soils along upland drainageways. The included soils make up about 5 to 15 percent of the map unit.

Permeability is moderate. The available water capacity is high. Runoff is very rapid. The content of organic matter is low, and natural fertility is low.

In most areas, this soil is under a cover of trees, shrubs, and native grasses.

This soil is not suited to cultivated crops or to trees and shrubs in windbreaks. It is too steep to be successfully tilled or planted.

Using this soil as rangeland is effective in controlling wind and water erosion. Overgrazing, however, reduces the protective cover and causes the potential natural vegetation to deteriorate. It can also result in severe gully erosion. Proper grazing use, timely deferment of grazing, and a planned grazing system help to maintain or improve the range condition.

This soil is too steep for use as building sites. Installation of sanitary facilities is impractical. Construction of roads and streets across these areas generally requires deep landfills or bridges.

This soil is assigned to capability unit VIIe-1, dryland. It is in Thin Loess range site and in windbreak suitability group 10.

Fm—Fillmore silt loam, 0 to 1 percent slopes. This is a nearly level, poorly drained, occasionally ponded soil in shallow depressions on the upland loess plains. Areas are nearly round or oblong in shape. They range from 5 to 100 acres in size. Where this soil is cultivated, the surface layer is grayer than in the surrounding soils.

Typically, the surface layer is gray, very friable silt loam about 12 inches thick. The subsoil is about 35 inches thick. It is very firm, dark gray silty clay in the upper part, very firm, grayish brown silty clay in the middle part, and firm, grayish brown silty clay loam in the lower part. The underlying material to a depth of about 60 inches is light brownish gray, friable, heavy silt loam.

Included in mapping are small areas of somewhat poorly drained Butler soils. Also included are small areas of Scott soils that are in the lowest part of the depressions. These included soils make up about 12 percent of this map unit.

Permeability is very slow, and the available water capacity is high. Reaction is medium acid in the plow layer and the subsurface layer and neutral in and below the subsoil. Natural fertility is medium, and the content of organic matter is moderate. Runoff from adjacent areas causes ponding, and permeability is very slow in the claypan subsoil; therefore, excess water is removed mostly by evaporation. It is difficult for roots to penetrate the subsoil. The water intake rate is low. This soil has a perched seasonal high water table that fluctuates from 6 inches above the surface to a depth of 1 foot below the surface.

This soil is mainly under cultivation.

Under dryland management, this soil is suited to corn, soybeans, grain sorghum, wheat, and grasses for hay and pasture. It is best suited to grain sorghum and grasses because of the problems of wetness in spring and droughtiness in summer. Because this soil is occasionally ponded (fig. 9), spring planting commonly is delayed. Grading helps to prevent ponding.

This soil is poorly suited to irrigated crops. Under irrigation, the main problems are ponding and the perched seasonal high water table. This soil has a low intake rate, so water needs to be applied at frequent intervals. Maintaining the content of organic matter and fertility are also concerns in management.

This soil is suited to use as pasture and hayland. Most cool-season grasses are suitable, but grasses that can withstand occasional ponding should be selected. In years of abnormally high rainfall, alfalfa may drown out. Lime is needed for good yields of alfalfa. When the soil is wet, grazing should be deferred to prevent surface compaction and to maintain the health of the plant community.

The soil is poorly suited to trees and shrubs in windbreaks. Only those trees and shrubs that tolerate occasional ponding should be planted. Weeds and grasses can be eliminated by using conventional cultivation equipment between tree rows and by hand hoeing or using selective herbicides in the rows.

This soil is not suited to septic tank absorption fields because of the very slow permeability and ponding. A suitable alternate site is needed. If sewage lagoons are constructed, they need to be diked above the elevation of ponding, and the lagoon bottom needs to be raised above the water table.

This soil is not suited to use as building sites because of ponding and a high shrink-swell potential in the subsoil. A substitute site is needed.

This soil is poorly suited to road construction. Roads need to be designed to overcome the high shrink-swell potential and low soil strength and to withstand frost action. Mixing the base material with additives helps to

Figure 9.—Soybeans on Fillmore silt loam, 0 to 1 percent slopes, are subject to damage by water.

overcome the shrinking and swelling. Ponding and wetness are limitations. Adequate side ditches need to be installed and roads need to be constructed on suitable fill material to overcome wetness and ponding.

This soil is assigned to capability unit IIIw-2, dryland and irrigated. It is in Clayey Overflow range site and in windbreak capability unit 2W.

Gb—Gibbon silty clay loam, 0 to 2 percent slopes. This is a nearly level, somewhat poorly drained soil on bottom lands of the Platte River. This soil is occasionally flooded. Areas are irregular in shape and range from 5 to 400 acres in size.

Typically, the surface layer is very dark gray and dark gray, friable silty clay loam about 14 inches thick. The transition layer is gray, friable clay loam about 5 inches thick. The underlying material to a depth of 60 inches is light gray clay loam in the upper part, sandy loam in the middle part, and loamy sand in the lower part. This soil is calcareous throughout. In a few small areas, the surface layer is loam.

Included in mapping are small areas of Ovina soils on the higher parts of the landscape. These soils make up 5 to 10 percent of this map unit.

Permeability is moderate, and the available water capacity is high. Runoff is slow. This soil has a seasonal high water table that fluctuates from a depth of about 1.5 feet in wet years to about 3 feet in dry years. The water table generally is highest in winter and spring. The content of organic matter is moderate, and natural fertility is high. The water intake rate is moderate. This soil releases moisture readily to plants. It is easily tilled within a fairly wide range of moisture content. The shrink-swell potential is moderate in the upper part of the soil and low in the lower part. Reaction is moderately alkaline to a depth of about 36 inches and strongly alkaline below this depth.

This soil is mainly under cultivation. In some places, the soil is in native grasses that are used for grazing or mowed for hay.

Under dryland management, this soil is suited to corn, grain sorghum, soybeans, and wheat. Wetness caused by the high water table and flooding are the major concerns in management. Tillage and planting commonly are delayed. If suitable outlets are available, open drains help to remove the surface water and tile drains help to lower the water table. In dry years, the high water table is beneficial to crops. Conservation practices, for example, minimum tillage, stripcropping, and stubble mulching, help to prevent soil blowing. Returning crop residue to the soil helps to maintain or improve the

content of organic matter and fertility. Using commercial fertilizers also helps to maintain high fertility.

Under irrigation, this soil is suited to corn (fig. 10), soybeans, and alfalfa. Tillage commonly is delayed in spring. Tile or open ditches can be installed if a suitable outlet is available. Land leveling helps to improve surface drainage and makes it possible to use irrigation water more efficiently. Returning crop residue to the soil and applying fertilizer help to maintain fertility.

This soil is suited to use as rangeland. Native grasses provide a dependable source of forage in the summer. Overstocking and overgrazing cause the plant community to deteriorate. The distribution of livestock on rangeland can be improved by proper location of fences, watering places, and salting facilities. Grazing when the soil is wet can cause the surface soil to become compacted and bogs or small mounds to form. Hay harvesting and grazing then become difficult.

This soil is suited to trees and shrubs that tolerate a seasonal high water table and occasional flooding. Undesirable grasses and weeds are a concern in management, because they compete with young trees for moisture and sunlight. Weeds can be controlled by cultivating between rows and by using selective herbicides.

This soil is poorly suited to septic tank absorption fields because of the hazard of flooding and the seasonal high water table. A substitute site is needed. Sewage lagoons need to be raised, diked, and sealed, or another site needs to be selected. This soil is not suited to use as building sites because of flooding.

The use of this soil for roads and streets is limited by the possibility of frost action and flooding. A gravel moisture barrier in the subgrade helps to prevent damage caused by frost action. Side ditches along roads carry off floodwater and help to lower the water table. Roadbeds can be graded to improve surface drainage.

This soil is in capability units IIw-4, dryland, and IIw-3, irrigated. It is in Subirrigated range site and in windbreak suitability group 2S.

Gr—Grigston silt loam, 0 to 1 percent slopes. This is a deep, nearly level, well drained soil on wide, high bottom lands. The areas are adjacent to old drainageways that meander across the terraces of the Platte River. This soil is rarely flooded. Areas range from 40 to about 350 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 19 inches thick. The upper part of the underlying material is mixed dark grayish brown and

Figure 10.—Row-irrigated corn on Gibbon silty clay loam, 0 to 2 percent slopes, on Platte River bottom land.

light gray, friable silt loam. The middle part of the underlying material is dark gray silt loam. The lower part of the underlying material to a depth of 60 inches is dark grayish brown silt loam. In places, there are small areas of soils that have strata that contain more clay.

Included in mapping are small areas of Gibbon soils in lower positions on the landscape. These included soils make up about 5 percent of the map unit.

Permeability is moderate. Runoff is medium. The available water capacity is high. The water intake rate is moderate. The content of organic matter is moderate, natural fertility is high, and tilth is good.

Almost all of this soil is farmed.

Under dryland management, this soil is suited to wheat, corn, grain sorghum, oats, and grasses and legumes. The main concerns in management are soil blowing, moisture conservation, and loss of plant nutrients. Soil blowing can be controlled by keeping the soil adequately covered by crops and by using conservation practices that leave crop residue on the surface. These practices also help to reduce moisture loss. Returning crop residue to the soil and spreading barnyard manure help to improve fertility and tilth and to increase infiltration of water.

Under irrigation, this soil is suited to corn, soybeans, grain sorghum, and alfalfa. Land leveling increases the efficiency of irrigation systems. Crops respond well to commercial fertilizers. Conservation practices, for example, minimum tillage, stripcropping, and stubble mulching, help to prevent soil blowing and loss of soil moisture by evaporation.

This soil is suited to trees and shrubs in windbreaks. The main concern is competition from grasses and weeds. Weeds can be controlled by mechanical cultivation between tree rows. Hand hoeing, rototilling, and appropriate herbicides help to control weeds in the rows.

The hazard of rare flooding is a limitation if this soil is used for sanitary facilities and building sites. Buildings need to be constructed on suitable, well compacted fill material. Sewage lagoons need to be diked against flooding and sealed to prevent seepage. This soil is suited to local roads and streets. Low strength and flooding are concerns. Roads need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance.

This soil is assigned to capability units I-1, dryland, and I-6, irrigated. It is in Silty Lowland range site and in windbreak suitability group 1.

Ha—Hall silt loam, 0 to 1 percent slopes. This is a deep, nearly level, well drained soil on terraces of the Platte River and the Big Blue River. This soil is rarely flooded. Areas range from 20 to 200 acres in size.

Typically, the upper part of the surface layer is dark gray, friable silt loam. The lower part is dark grayish brown, friable silt loam. The surface layer is about 18 inches thick. The upper part of the subsoil is dark grayish brown, friable silty clay loam, and the lower part is brown, friable silty clay loam. The subsoil is about 21 inches thick. The underlying material to a depth of about 60 inches is pale brown silt loam. In a few areas, the subsoil contains more clay than is within the range defined for Hall soils.

Included in mapping are some areas of Muir soils. These soils make up about 20 percent of the map unit.

Permeability is moderate. The available water capacity is high. Runoff is slow. Natural fertility is high, and the content of organic matter is moderate. The surface layer is friable and easily tilled within a wide range of moisture content. This soil releases moisture readily to plants. The water intake rate is moderate. Reaction is slightly acid or neutral in the surface layer and neutral below it. Tilth is good.

Nearly all the acreage is used for cultivated crops. In most places, the soil is irrigated.

Under dryland management, this soil is suited to corn, soybeans, sorghum, and wheat. This soil is suited to grasses and alfalfa for hay and pasture, but it is seldom used for this purpose. Conservation practices, for example, minimum tillage, stripcropping, and stubble mulching, help to prevent soil blowing and loss of soil moisture by evaporation. Returning crop residue to the soil helps to maintain or improve the content of organic matter and fertility. Using commercial fertilizers and spreading barnyard manure help to maintain high fertility.

Under irrigation, the soil is suited to corn, soybeans, grain sorghum, and alfalfa. Land leveling helps improve water distribution and increases the efficiency of gravity irrigation systems. Crops respond well to commercial fertilizers. Conservation practices, for example, minimum tillage, stripcropping, and stubble mulching, help to prevent soil blowing and loss of soil moisture by evaporation.

This soil is suited to trees and shrubs in windbreaks. Droughtiness and competition for moisture from weeds and grasses are the main concerns. Competitive weeds and grasses can be eliminated by using conventional cultivation equipment between tree rows, hand hoeing in the rows, or using selective herbicides.

This soil is suited to septic tank absorption fields. Sewage lagoons need to be lined with less permeable material or sealed with chemicals to prevent seepage, or an impervious liner can be installed. Foundations of buildings need to be designed to withstand the moderate shrink-swell potential. Backfilling around foundations with coarser material helps prevent damage by the shrinking and swelling. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength.

This soil is assigned to capability units I-1, dryland, and I-6, irrigated. It is in Silty Lowland range site and in windbreak suitability group 1.

Hc—Hastings silt loam, 0 to 1 percent slopes. This is a deep, nearly level, well drained soil on broad divides of the loess uplands. Areas are irregular in shape and range from 20 to several hundred acres in size.

Typically, the surface layer is about 10 inches thick. The upper part is grayish brown, friable silt loam. The lower part is dark grayish brown, friable silty clay loam. The subsoil is friable silty clay loam about 30 inches thick. It is dark grayish brown in the upper part, brown in the middle part, and pale brown in the lower part. The underlying material to a depth of about 60 inches is light yellowish brown silty clay loam in the upper part and very pale brown silt loam in the lower part.

Included in mapping are small areas of the poorly drained Butler and Fillmore soils in slightly lower positions. The included soils make up about 5 percent of the map unit.

Permeability is moderately slow. The water intake rate is moderately low. Runoff is slow. The available water capacity is high. The content of organic matter is moderate, and natural fertility is high. The shrink-swell potential is high. The surface layer is easily tilled within a wide range of moisture content.

Nearly all the acreage is under cultivation.

Under dryland management, this soil is suited to corn, sorghum, wheat, and oats. This soil has few hazards or limitations. It is one of the more productive soils in the county. Conservation practices, for example, minimum tillage and stubble mulching, help to prevent soil blowing and conserve moisture. Returning crop residue to the soil helps to maintain the content of organic matter and fertility. Using commercial and organic fertilizers helps to maintain high fertility.

If irrigated, this soil is suited to corn, soybeans, grain sorghum, and alfalfa. A minor amount of land leveling helps to increase the efficiency of irrigation systems. Crops respond well to commercial fertilizers. Stripcropping, minimum tillage, and stubble mulching help to conserve moisture and reduce soil blowing.

This soil is suited to trees, shrubs, and conifers in windbreaks. Competition from weeds and undesirable grasses is the main concern in establishing windbreaks. Cultivating between tree rows and using selective herbicides help to control grasses and weeds that can choke out seedlings. Seedlings and young trees need to be protected from livestock.

Septic tank absorption fields need to be enlarged or designed to overcome the moderately slow permeability, or another type of sewage system can be installed. Sewage lagoons need to be lined with less permeable material, or an impervious liner can be installed to control seepage.

Strengthening the foundations of buildings and modifying the abutting soil material or backfilling with coarser material help to prevent damage caused by the shrinking and swelling of the soil.

For roads and streets, the high shrink-swell potential of the soil can be reduced by mixing the soil with coarser material. The road base needs to be strengthened because of the low soil strength.

This soil is assigned to capability units I-1, dryland, and I-4, irrigated. It is in Silty range site and in windbreak suitability group 3.

HcB—Hastings silt loam, 1 to 3 percent slopes. This is a very gently sloping, well drained soil on broad divides of uplands. Some areas are nearly 100 acres in size; the slopes in these areas are rather long and smooth. In other areas, the slopes are gently undulating and are on long, narrow ridges that are adjacent to basins and depressions or surrounded by flatland. These areas range from about 10 to 100 acres in size.

Typically, the surface layer is about 11 inches thick. The upper part is dark gray, friable silt loam, and the lower part is dark grayish brown, friable silty clay loam. The subsoil is about 25 inches thick. The upper part is dark brown, friable silty clay loam, the middle part is brown, firm silty clay loam, and the lower part is pale brown, friable silty clay loam. The underlying material, at a depth of about 36 inches, is very pale brown silt loam. In some places, the underlying material is calcareous. Near the base of slopes, the surface layer tends to be thicker than is typical of Hastings soils.

Included in mapping are a few small areas of Butler soils in depressions in the gently undulating areas. These soils make up about 5 percent of the map unit.

Permeability is moderately slow. The available water capacity is high. The water intake rate of this soil is moderately low. Runoff is medium. The content of organic matter is moderate, and natural fertility is high. The shrink-swell potential in the subsoil is high. The surface layer is easily tilled within a wide range of moisture content.

This soil is mainly under cultivation. In many areas, the soil is used for irrigated crops.

Under dryland management, this soil is suited to corn, sorghum, wheat, and oats. Conservation practices, for example, minimum tillage, stubble mulching, and stripcropping, help to prevent soil erosion and conserve moisture. Returning crop residue to the soil helps to maintain the content of organic matter and fertility. Applying commercial and organic fertilizer helps to maintain high fertility.

Under irrigation, the soil is suited to corn, soybeans, grain sorghum, and alfalfa. Crops respond well to commercial fertilizers. Conservation practices that add organic matter to the soil, for example, minimum tillage and stubble mulching, help to conserve moisture, reduce erosion, and maintain fertility. Both gravity and sprinkler irrigation systems are suitable.

This soil is suited to trees, shrubs, and conifers in windbreaks. Competition from weeds and undesirable

grasses is the main hindrance to establishing tree seedlings. Cultivating between tree rows and using selective herbicides help to control grasses and weeds. Seedlings and young trees need to be protected from livestock.

Septic tank absorption fields need to be enlarged or specially designed to compensate for the moderately slow permeability, or another type of sewage system can be installed. Sewage lagoons need to be lined with less permeable soil material or with impervious liners to control seepage.

Strengthening the foundations of buildings and modifying the abutting soil material or backfilling with coarser material help to overcome the shrink-swell potential.

For roads and streets, mixing the soil with coarser soil material and treating the soil with additives help to reduce the high shrink-swell potential. Road bases can be strengthened to overcome low soil strength.

This soil is assigned to capability units IIe-1, dryland, and IIe-4, irrigated. It is in Silty range site and in windbreak suitability group 3.

HcC—Hastings silt loam, 3 to 6 percent slopes. This is a gently sloping, well drained soil on loess uplands. It is on convex ridgetops and broad areas at the heads of intermittent drainageways. Areas are irregular in shape and range from 10 to 60 acres in size.

Typically, the surface layer is about 12 inches thick. The upper part is dark grayish brown, very friable silt loam, and the lower part is dark grayish brown, friable silty clay loam. The subsoil is about 30 inches thick. The upper part is brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam. The underlying material to a depth of 60 inches is light brownish gray silt loam. In some places, the underlying material is calcareous.

Included in mapping are small areas of silty soils that formed in alluvium. These soils are along the bottom of drainageways and make up about 5 percent of the map unit.

Permeability is moderately slow. The water intake rate is moderately low. The available water capacity is high. Runoff is medium. Reaction is neutral in the surface layer and mildly alkaline in the subsoil. The content of organic matter is moderate, and natural fertility is high. The surface layer is easily tilled within a wide range of moisture content.

This soil is mainly under cultivation. In a few areas, the soil is irrigated, and in some small areas, it is used as pasture.

Under dryland management, this soil is suited to corn, grain sorghum, soybeans, and alfalfa. If the soil is used for row crops, water erosion is difficult to control. Grassed waterways and conservation tillage practices, for example, minimum tillage, help to prevent excessive soil loss. Returning crop residue to the soil helps to improve fertility, increase the content of organic matter, and reduce soil erosion.

Under irrigation, the soil is suited to grain sorghum, soybeans, and alfalfa. Sprinkler irrigation systems are best suited because of the difficulty in controlling irrigation water with other methods. Conservation practices that return plant residue to the soil, for example, minimum tillage, help to increase the content of organic matter and improve the water intake rate.

This soil is suited to use as pasture. Pasture generally is bromegrass or a mixture of bromegrass and alfalfa or orchardgrass and alfalfa. Overgrazing or improper haying methods reduce the protective cover and cause the plant population to deteriorate. A grass cover is highly effective in controlling erosion. Proper stocking, rotation grazing, and fertilizing with nitrogen help to maintain maximum yields and keep the grasses in good condition. Timely mowing reduces weed competition.

This soil is suited to trees in windbreaks. Drought and competition for moisture from weeds and grasses are the major concerns. Weeds can be eliminated by mechanical cultivation between rows and by hand hoeing or using selective herbicides in tree rows. On steeper slopes, erosion is a hazard. Planting trees on the contour and cover crops between tree rows help to control erosion. Seedlings and young trees need to be protected from by livestock.

The moderately slow permeability of this soil is a limitation for septic tank absorption fields. This limitation generally can be overcome by increasing the size of the absorption field. Land shaping and contour installation generally are necessary for proper operation of the field. For sewage lagoons, grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage caused by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to overcome the shrinking and swelling.

This soil is assigned to capability units IIIe-1, dryland, and IIIe-4, irrigated. It is in Silty range site and in windbreak suitability group 3.

HcD—Hastings silt loam, 6 to 11 percent slopes. This is a strongly sloping, well drained soil along intermittent drainageways of the loess uplands. This soil is on slopes that are convex on the upper part and concave on the lower part. Areas generally range from 5 to 20 acres in size.

Typically, the surface layer is about 17 inches thick. The upper part is very dark gray, friable silt loam, and the lower part is dark gray, friable silty clay loam. The subsoil is about 29 inches thick. The upper part is grayish brown, friable silty clay loam, the middle part is brown, firm silty clay loam, and the lower part is brown,

friable silty clay loam. The underlying material to a depth of about 60 inches is pale brown silt loam.

Included in mapping are small, narrow areas of silty soils on the bottoms of drainageways. The soils on the bottoms of some drainageways have a seasonal high water table. These included soils make up about 8 percent of the map unit.

Permeability is moderately slow. The water intake rate is moderately low. Runoff is medium. The available water capacity is high. Natural fertility is high, and the content of organic matter is moderate. The surface layer is easily tilled within a fairly wide range of moisture content.

This soil is mainly used as pasture. In many areas, the soil is in farmsteads or other building sites.

Under dryland management, this soil is suited to corn, soybeans, grain sorghum, small grains, and alfalfa. Erosion is a hazard. Sheet erosion can occur and gullies can form unless conservation practices are used. Grassed waterways and conservation practices that include minimum tillage, contour farming, and terracing help to prevent further soil loss. Returning crop residue to the soil and regularly adding organic matter help to maintain and improve fertility and tilth and to reduce erosion.

Under sprinkler irrigation, this soil is suited to corn, grain sorghum, and alfalfa. Water erosion is the most serious hazard. The same conservation practices that control erosion under dryland management can be used under irrigation. Efficient management of irrigation water is a concern.

This soil is suited to use as pasture. Properly managed grass or grass and legume pasture is effective in preventing erosion. Management that includes proper stocking, rotation grazing, and fertilizing helps to reduce soil compaction, excessive runoff, and erosion. Gullies and rills can result from erosion.

The soil is also suited to use as rangeland. Proper grazing use and deferred grazing help to keep the soil and plants in good condition.

This soil is suited to trees and shrubs in windbreaks. Water erosion is a major hazard. Competition for moisture from grasses and weeds is the main hindrance to seedling growth. Planting trees on the contour and cover crops between rows help to reduce erosion. Cultivating between trees and using selective herbicides help to control grasses and weeds. Seedlings and young trees need to be protected from livestock.

The moderately slow permeability of this soil is a limitation for septic tank absorption fields. This limitation generally can be overcome by increasing the size of the absorption field. Land shaping and installing the absorption field on the contour generally are necessary for proper operation of the field. For sewage lagoons, grading is required to modify the slope and shape the lagoon. Lagoons need to be lined or sealed to prevent seepage. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage caused by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to overcome the shrinking and swelling.

This soil is assigned to capability units IVe-1, dryland, and IVe-4, irrigated. It is in Silty range site and in windbreak suitability group 3.

HdC2—Hastings silty clay loam, 3 to 6 percent slopes, eroded. This is a gently sloping, well drained soil on ridgetops and upper side slopes along intermittent drainageways. The surface layer is lighter colored than in uneroded Hastings soils. Most of the surface layer has been removed by sheet and rill erosion. The subsoil is mixed with the surface layer during tillage. Rills commonly form during heavy rains. Areas generally are longer than they are wide. They range from 5 to 40 acres in size.

Typically, the surface layer is grayish brown, firm silty clay loam about 6 inches thick. The upper part of the subsoil is brown, firm silty clay loam, and the lower part is pale brown, friable silty clay loam. The subsoil is about 21 inches thick. The underlying material to a depth of about 60 inches is very pale brown silt loam.

Included in mapping are small areas of Hobbs soils and Kezan soils along the bottoms of drainageways. Also included are small areas of Uly soils on steeper slopes. These included soils make up about 5 percent of the map unit.

Permeability is moderately slow. The available water capacity is high. Runoff is rapid. The water intake rate is low. Reaction is slightly acid in the surface layer and neutral below the surface layer. Natural fertility is medium, and the content of organic matter is moderately low. Tilth is generally fair, but tillage is somewhat difficult because this soil has more clay and less organic matter in the surface layer than uneroded Hastings soils have.

Most of the acreage is cultivated. In a few small areas the soil is in pasture and trees.

Under dryland management, this soil is suited to corn, grain sorghum, wheat, soybeans, and alfalfa (fig. 11). Erosion is a hazard. If the soil is used for row crops, water erosion is difficult to control. Grassed waterways and conservation tillage practices, for example, minimum tillage, help prevent further soil loss. Returning crop residue to the soil helps to improve fertility, increase the content of organic matter, and reduce soil erosion.

Under irrigation management, a sprinkler system is most suitable, because it is difficult to control irrigation water with other methods. The rate at which water is applied should not exceed the intake rate of the soil. Conservation practices that return crop residue to the soil, for example, minimum tillage, help to build up the content of organic matter and thus improve the water intake rate and conserve moisture. With proper

Figure 11.—Corn on Hastings silty clay loam, 3 to 6 percent slopes, eroded.

management, corn, grain sorghum, and alfalfa can be grown with good success.

This soil is suited to use as pasture. Properly managed grassland or grass and legume pasture is effective in controlling erosion. Overgrazing results in surface compaction and excessive runoff.

This soil is suited to use as rangeland. Proper grazing use, deferred grazing, a planned grazing system, and restricted use in very wet periods help to keep the grasses in good condition.

This soil is suited to trees in windbreaks. Erosion, drought, and competition for moisture from weeds and grasses are the main concerns. Planting trees on the contour and cover crops between rows help to conserve moisture and to prevent excessive runoff and erosion. Weeds can be controlled by mechanical cultivation between the rows and by hand hoeing or using herbicides in the rows.

The moderately slow permeability of this soil is a limitation for septic tank absorption fields. This limitation generally can be overcome by increasing the size of the absorption field. Land shaping and installing the absorption field on the contour generally are necessary for proper operation of the field. For sewage lagoons, grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage caused by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to prevent the shrinking and swelling.

This soil is assigned to capability units IIIe-8, dryland, and IIIe-3, irrigated. It is in Silty range site and in windbreak suitability group 3.

HdD2—Hastings silty clay loam, 6 to 11 percent slopes, eroded. This is a deep, strongly sloping, well drained soil on slopes that are convex on the upper part

and concave on the lower part. The surface layer is lighter colored than in uneroded Hastings soils. Sheet and rill erosion have removed enough of the surface layer that the subsoil is mixed with the surface layer during tillage. Rills and gullies commonly form during heavy rainfall. Most areas are dissected by shallow drainageways. The areas generally are long and narrow. They range from 5 to 85 acres in size.

Typically, the surface layer is dark gray, friable silty clay loam about 7 inches thick. The subsoil is friable silty clay loam about 18 inches thick. It is brown in the upper part, pale brown in the middle part, and light yellowish brown in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, mottled silt loam. In some areas, the underlying material is calcareous.

Included in mapping are small areas of Kezan soils along drainageways. Also included are small areas of Uly soils on steeper slopes. These included soils make up less than 5 percent of the map unit.

Permeability is moderately slow. The water intake rate is low. Runoff is rapid. The available water capacity is high. Natural fertility is medium, and the content of organic matter is moderately low. This soil is more difficult to till than uneroded Hastings soils, because there is more clay and less organic matter in the surface layer.

Most of this soil is under cultivation. In a few small areas, the soil is in pasture.

Under dryland management, this soil is suited to corn, grain sorghum, small grains, and alfalfa. Erosion is a hazard on this soil. Grassed waterways and conservation practices that include minimum tillage, contour farming, and terracing help to prevent excessive soil loss. Returning crop residue to the soil and regularly adding organic matter help to improve fertility and tilth and to reduce erosion.

If this soil is irrigated, a sprinkler system is the only suitable kind because of the difficulty in controlling irrigation water with other methods. The rate at which water is applied should not exceed the water intake rate of the soil. Close-growing crops help control erosion. Conservation tillage practices that return crop residue to the soil, for example, no-till planting, help to conserve moisture, add organic matter, and reduce erosion.

This soil is suited to use as pasture. Properly managed grassland or grass and legume pasture is effective in preventing erosion. Management that includes adding fertilizer and rotation grazing helps to reduce compaction, excessive runoff, and erosion. Gullies and rills result from erosion.

This soil is also suited to use as rangeland. Proper grazing use and deferred grazing help to keep the soil and plants in good condition.

This soil is suited to trees and shrubs in windbreaks. Water erosion is a major hazard to establishing tree seedlings. Competition for moisture from grass and weeds is the main hindrance to seedling growth. Planting trees on the contour and cover crops between rows help to reduce erosion. Cultivating between trees and using selective herbicides help to control grasses and weeds.

This soil has good potential for habitat for openland and rangeland wildlife. The main threat to wildlife is the destruction of habitat. Preserving and improving existing habitat or establishing new habitat help considerably to increase wildlife populations.

The moderately slow permeability of this soil is a limitation for septic tank absorption fields. This limitation generally can be overcome by increasing the size of the absorption field. Land shaping and installing the absorption field on the contour generally are necessary for proper operation of the field. For sewage lagoons, grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage caused by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to overcome the shrinking and swelling.

This soil is assigned to capability units IVe-8, dryland, and IVe-3, irrigated. It is in Silty range site and in windbreak suitability group 3.

Hg—Hobbs silt loam, 0 to 1 percent slopes. This is a deep, nearly level, well drained soil on occasionally flooded bottom lands adjacent to streams. Areas are long and narrow and range from 10 to about 60 acres in size.

Typically, the surface layer is grayish brown, very friable silt loam about 7 inches thick. The upper part of the underlying material is stratified grayish brown and light brownish gray silt loam about 18 inches thick. The lower part of the underlying material to a depth of 60 inches is mixed dark grayish brown and light brownish gray and grayish brown silt loam.

Included in mapping are some very small areas of dark silty soils in slightly higher positions in colluvial areas adjacent to uplands. These included soils make up about 5 percent of the map unit.

Permeability is moderate. Runoff is slow. The available water capacity is high. The water intake rate is moderate. The content of organic matter is moderate, and natural fertility is high. Tilth is good.

Most of the acreage is farmed. In some areas, the soil is in grasses or in stands of native trees. Areas of grassland and woodland generally are dissected by meandering streams, so access is difficult or impractical for equipment.

Under dryland management, this soil is suited to wheat, corn, grain sorghum, oats, and alfalfa. The main

concerns in management are occasional flooding and moisture conservation. Flooding often delays tillage or damages crops. Conservation tillage practices that leave crop residue on the surface, for example, minimum tillage and stubble mulching, help to control erosion and to conserve moisture. Returning crop residue to the soil, planting green manure crops, and spreading barnyard manure add organic matter to the soil and help to maintain or improve fertility and tilth and to increase the infiltration of water.

Under irrigation, this soil is suited to corn, alfalfa, and soybeans. The main concerns in management are loss of plant nutrients through flooding and moisture conservation. Conservation practices that return crop residue to the soil add organic matter to the soil and help to conserve soil moisture, prevent soil blowing, and maintain fertility. This soil is suited to gravity or sprinkler irrigation.

This soil is suited to use as pasture. Overgrazing or improper haying methods reduce the protective cover and cause the plant community to deteriorate. Proper stocking, rotation grazing or haying, and using fertilizer help to maintain or improve pasture conditions.

The soil is suited to use as rangeland. Proper grazing use and deferred grazing help to prevent soil erosion and keep the range productive.

This soil generally provides a good site for trees and shrubs in windbreaks. Trees and shrubs that can tolerate occasional flooding are best suited. Seedlings generally survive and grow well. Competition for moisture from weeds and grasses is the main concern in management. Undesirable grasses and weeds can be controlled by cultivation between the rows and by using appropriate herbicides or rototilling in the row.

This soil is not suited to use as a site for buildings, septic tank absorption fields, or sewage lagoons because of flooding. Substitute sites need to be considered.

To protect roads from flooding, adequate side ditches and culverts need to be installed and roads need to be constructed on suitable, well compacted fill material above flood level. Roads need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength.

This soil is assigned to capability units IIw-3, dryland, and IIw-6, irrigated. It is in Silty Overflow range site and in windbreak suitability group 1.

HhB—Hobbs silt loam, channeled, 0 to 3 percent slopes. This is a nearly level, well drained soil on bottom lands that are bordered by steep side slopes. This soil is frequently flooded. Areas of this soil include entrenched channels. The areas are elongated and range from about 5 to over 100 acres in size.

Typically, the surface layer is stratified pale brown and dark grayish brown, friable silt loam about 10 inches thick. The upper part of the underlying material is stratified brown and dark grayish brown silt loam about 12 inches thick. The middle part is stratified very pale brown and grayish brown silt loam about 6 inches thick. The lower part of the underlying material to a depth of about 60 inches is mixed dark grayish brown and pale brown silt loam. In a few small areas, the soil is not so well drained.

Included in mapping are small areas of exposed loess or glacial till at the upper end of drainageways on short steep slopes adjacent to the channels. These included areas make up about 5 percent of the map unit.

Permeability is moderate. Runoff is slow. The available water capacity is high. The content of organic matter is moderate, and natural fertility is high.

Most of the acreage is in native grasses or native trees.

This soil is not suited to dryland and irrigated farming because of flooding and the entrenched channels. These channels are too deep to cross with farm equipment, and steep banks around the level areas make the use of conventional farm machinery difficult.

This soil is suited to use as rangeland. Overgrazing and deposition of silt cause the potential native plant community to deteriorate. Proper grazing use and a planned grazing system help to maintain or improve the range condition.

This soil is not suited to trees and shrubs in windbreaks because of the entrenched channels.

This soil is suited to use as habitat for wildlife. A wide variety of plants that provide food and cover for rangeland and woodland wildlife can grow on this soil. The main threat to wildlife is the destruction of habitat.

This soil is not suited to septic tank absorption fields, sewage lagoons, or use as building sites because of the entrenched channels and flooding. Roads and streets need to be constructed on suitable, well compacted fill material above flood level. Roads need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength.

This soil is assigned to capability unit VIw-7, dryland. It is in Silty Overflow range site and in windbreak suitability group 10.

HkB—Holder silt loam, 1 to 3 percent slopes. This is a deep, well drained, very gently sloping soil on long slopes and ridgetops of the loess uplands adjacent to the Platte River breaks. Areas are long and irregular in shape. They range from 50 to several hundred acres in size.

Typically, the surface layer is friable silt loam about 13 inches thick. It is dark grayish brown in the upper part and dark brown in the lower part. The subsoil is firm silty clay loam that is brown in the upper part, pale brown in the middle part, and light yellowish brown in the lower part. It is about 29 inches thick. The underlying material to a depth of 60 inches is very pale brown silt loam. On the lower part of slopes, there are small areas where the soil is darker to a greater depth than is typical. In narrower areas where the slopes are more convex, there

are small areas where the surface layer is thinner than is typical for this soil.

Included in mapping are small areas of Hastings soils that are in similar positions on the landscape. These included soils make up about 7 percent of the map unit.

Permeability and the water intake rate are moderate. The available water capacity is high. Runoff is medium. The content of organic matter is moderate, and natural fertility is high. The surface layer is easily tilled within a moderately wide range of moisture content.

This soil is mainly used for cultivated crops under dryland or irrigation management.

Under dryland management, this soil is suited to corn, soybeans, sorghum, and wheat. This soil has few hazards or limitations. It is one of the more productive soils in the county. Conservation tillage practices, for example, minimum tillage, stripcropping, and stubble mulching, help to prevent soil blowing and to conserve soil moisture. Returning crop residue to the soil helps to maintain and improve the content of organic matter and fertility. Spreading barnyard manure helps to maintain high fertility.

In some places, this soil is irrigated. Under irrigation, it is suited to corn, soybeans, grain sorghum, and alfalfa. Land leveling helps to increase the efficiency of irrigation systems. Conservation tillage practices, for example, minimum tillage, stripcropping, and stubble mulching, help to prevent soil blowing and to conserve soil moisture.

This soil is suited to use as pasture, but it is seldom used for this purpose because of its value as cropland.

This soil is suited to trees and shrubs in windbreaks. Drought and competition for moisture from weeds and grasses are the main concerns. Weeds and grasses can be controlled by mechanical cultivation between tree rows and by hand hoeing or using selective herbicides in tree rows. Irrigation can be used in periods of low rainfall.

The moderate permeability is a slight limitation for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption field. For sewage lagoons, a minor amount of grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage caused by the moderate shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for the subbase material to insure better performance. Damage to roads and streets caused by frost action can be reduced by surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is assigned to capability units IIe-1, dryland, and IIe-4, irrigated. It is in Silty range site and in windbreak group 3.

IvC—Inavale loamy sand, 2 to 6 percent slopes. This is a deep, gently sloping, somewhat excessively drained soil on bottom lands of the Platte River. The soil is rarely flooded. It is on long, narrow ridges that are slightly higher than the surrounding soils. Areas range from 10 to 40 acres in size.

Typically, the surface layer is gray, loose loamy sand about 8 inches thick. The transition layer is light brownish gray, loose fine sand about 5 inches thick. The underlying material to a depth of about 60 inches is fine sand that is light brownish gray in the upper part and light gray in the lower part.

Included in mapping are small areas of Boel soils on the lower part of the landscape. These included soils make up about 5 percent of this unit.

Permeability is rapid. The available water capacity is low. Runoff is slow, because nearly all the rainwater enters the soil as rapidly as it falls. The content of organic matter and natural fertility are low. The water intake rate is very high, and this soil releases moisture readily to plants. The shrink-swell potential is low. Reaction is neutral throughout.

Almost all the acreage is in native grasses and is used as rangeland or for hay.

This soil is not suited to dryfarming because of droughtiness and a very severe hazard of soil blowing.

Under irrigation, this soil is poorly suited to the commonly grown crops. Soil blowing is a hazard, and droughtiness resulting from the low available water capacity is a problem. Low fertility is a major concern in management. Conservation tillage practices that keep crop residue on the surface are effective in controlling soil blowing. A sprinkler irrigation system is the most suitable because of the sandy soil and undulating topography. Because of the rapid permeability, fertilizer needs to be applied frequently and in small amounts through the irrigation system.

Using this soil as rangeland is effective in controlling erosion. Because these soils are sandy and droughty, the native grasses are sparse and unproductive. Overstocking and overgrazing reduce the protective cover and cause the plant community to deteriorate. The distribution of livestock can be improved by correctly locating fences, watering places, and salting facilities.

This soil is suited to those trees and shrubs that are adapted to sandy soils and tolerate droughty conditions. Lack of moisture and severe soil blowing are the main problems in establishing tree seedlings. Undesirable grasses and weeds are highly competitive for moisture. They can be controlled by cultivating between rows and by using selective herbicides. Cover crops planted between rows help to control soil blowing.

The native plants on this soil provide cover and food for upland game birds.

In some areas, this soil is suited to septic tanks, but because the soil is rapidly permeable, contamination of the underground water supply is a hazard. Sewage lagoons need to be diked and sealed, or a substitute site

needs to be considered. Building sites need to be constructed on elevated and well compacted fill material to protect them against flooding. The walls or sides of shallow excavations can be shored to prevent sloughing or caving. Roads and streets need to be protected against flooding. Side ditches help to prevent flood damage.

This soil is assigned to capability units VIe-5, dryland, and IVe-11, irrigated. It is in Sandy Lowland range site and in windbreak suitability group 5.

IwC—Inavale-Boel complex, 0 to 6 percent slopes. This complex consists of deep, nearly level to gently sloping soils that are occasionally flooded. The Inavale soil is somewhat excessively drained. It is very gently sloping and gently sloping and is on long, narrow ridges. The Boel soil is somewhat poorly drained. It is on bottom lands of the Platte River in swales and channels between the higher narrow ridges of Inavale soil.

Areas of this complex are 60 to 70 percent Inavale soil and 30 to 40 percent Boel soil. These soils are too closely intermingled to be shown separately on the map. The areas generally are longer than they are wide. They range from 10 to 80 acres in size.

Typically, the surface layer of the Inavale soil is gray, loose loamy sand 8 inches thick. The transition layer is grayish brown, loose fine sand. The underlying material to a depth of 60 inches is light gray, loose fine sand.

Typically, the surface layer of the Boel soil is dark gray, friable fine sandy loam about 12 inches thick. The transition layer is light gray, loose fine sand about 12 inches thick. The underlying material is light brownish gray, loose sand and coarse sand in the upper part and light gray, loose sand and coarse sand in the lower part.

Permeability is rapid for both soils. The available water capacity is low in the Inavale soil and moderate or low in the Boel soil. The content of organic matter is low in the Inavale soil and moderately low in the Boel soil. Natural fertility is low in the Inavale soil and medium in the Boel soil. The water intake rate is very high for the Inavale soil and moderately high for the Boel soil. The seasonal high water table in the Boel soil ranges from a depth of 1.5 to 3 feet. Runoff is slow in the Inavale soil and very slow in the Boel soil. The shrink-swell potential is low.

Almost all the acreage is in native grasses and is used as range or for hay. Only a few acres are in irrigated crops.

The soils generally are not suited to dryland crops because of the extreme disparity between the somewhat excessively drained Inavale soil on ridges and the poorly drained Boel soil in the lower, nearly level positions. The hazard of soil blowing is very severe.

The soils are not suited to gravity irrigation because of the rapid permeability and the uneven surface. They are poorly suited to sprinkler irrigation. Corn, grain sorghum, and alfalfa are the main irrigated crops. Occasional flooding can damage soil and crops. Soil blowing and low natural fertility are concerns. Conservation tillage practices that maintain crop residue on the surface are effective in controlling soil blowing. Fertilizer needs to be applied frequently and in small amounts through the irrigation system to reduce excessive leaching of plant nutrients in the rapidly permeable underlying material.

Using these soils as rangeland is effective in controlling erosion. Because these soils are sandy and droughty, the native grasses are sparse and unproductive. Overstocking and overgrazing reduce the protective cover and cause the plant community to deteriorate. The distribution of livestock can be improved by correctly locating fences, watering places, and salting facilities.

The Inavale soil is suited to those trees and shrubs that tolerate sandy and droughty conditions, and the Boel soil is suited to trees and shrubs that tolerate a high water table and occasional flooding. Lack of moisture is the major concern in establishing young trees, and soil blowing is a severe hazard. Undesirable grasses and weeds are highly competitive for moisture. They can be controlled by cultivating between rows and by using selective herbicides. Cover crops planted between rows help to control soil blowing.

These soils are not suited to septic tank absorption fields because of flooding and the poor filtering capability of the soil material. Because the soils are rapidly permeable, contamination of the ground water is a hazard. Sewage lagoons need to be elevated, diked, and sealed, or a substitute site needs to considered. These soils are not suitable for use as building sites because of flooding. Local roads and streets need protection from flooding. Adequate side ditches can intercept floodwater and drain it away.

These soils are assigned to capability units VIw-4, dryland, and IVw-11, irrigated. The Inavale soil is in Sandy Lowland range site, and the Boel soil is in Subirrigated range site. The Inavale soil is in windbreak suitability group 5, and the Boel soil is in windbreak suitability group 2.

JuC—Judson silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, well drained soil on concave foot slopes of uplands, along intermittent drainageways, and on stream terraces. Areas are long and narrow and range from 5 to 40 acres in size.

Typically, the upper part of the surface layer is dark gray, friable silt loam about 9 inches thick. The middle part is dark grayish brown, friable silt loam about 11 inches thick. The lower part of the surface layer is dark grayish brown, friable silty clay loam about 5 inches thick. The upper part of the subsoil is brown, friable silty clay loam about 6 inches thick. The middle part is light yellowish brown, friable silty clay about 11 inches thick. The lower part of the subsoil to a depth of 60 inches is very pale brown, friable silty clay loam. In some areas, the subsoil has more structural development and the surface layer is thinner. In some areas, the surface layer is loam.

Included in mapping are small areas of Burchard and Ponca soils on higher parts of the landscape. Also included are small areas of Hobbs soils adjacent to the drains. These included soils make up about 10 percent of the map unit.

Permeability is moderate. Runoff is medium. The available water capacity is high. The water intake rate is moderate. The content of organic matter is moderate, and natural fertility is high. Tilth is good.

Most of the acreage is farmed, but in many small areas, the soil is used as pasture, and in a few small areas, it is in native trees and grasses.

Under dryland management, this soil is suited to corn, grain sorghum, wheat, alfalfa, and soybeans. Erosion by water is a hazard because of the runoff from adjacent soils after heavy rains. Close-growing crops help to control water erosion. If row crops are grown, they should be planted on the contour. Terraces and grassed waterways also help to control water erosion. Conservation tillage practices that include stubble mulching and minimum tillage help to reduce wind erosion and prevent excessive soil loss. Returning crop residue to the soil helps to improve fertility and reduce erosion.

Under irrigation, this soil is suited to corn, grain sorghum, soybeans, and alfalfa. The rate at which water is applied should not exceed the intake rate of the soil. Conservation tillage practices that return crop residue to the soil help to prevent erosion, add organic matter to the soil, and help maintain fertility.

This soil is suited to use as pasture. The use of this soil as pasture is very effective in controlling soil blowing and water erosion. Overgrazing or improper haying methods reduce protective cover and cause the plant community to deteriorate. Overgrazing also leads to soil loss by water erosion.

The soil is also suited to use as rangeland. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to maintain or improve the range condition.

This soil is suited to trees and shrubs in windbreaks. Drought and competition for moisture from weeds and grasses are the main hazards. Weeds can be controlled by mechanical cultivation between tree rows and by hand hoeing or using selective herbicides in the rows. On steeper slopes, erosion is a hazard. Planting trees on the contour and planting cover crops between tree rows help to control erosion. Seedlings and young trees need to be protected from livestock. In periods of low rainfall, irrigation can be provided to ensure seedling survival.

This soil has good potential for habitat for openland and rangeland wildlife. The main threat to wildlife is lack of habitat. Destroying existing habitat should be avoided if possible. Establishing new habitat or improving existing habitat helps considerably to increase wildlife populations.

This soil is well suited to septic tank absorption fields. It is poorly suited to sewage lagoons because of seepage and slope. Lagoons need to be lined with less permeable material to prevent seepage. Sites for sewage lagoons may need to be leveled by cutting and filling, and lagoons need to be designed to accommodate the slope. Foundations of buildings need to be designed to withstand the moderate shrink-swell potential and to accommodate the slope. In some areas, diversion of runoff water from adjacent higher soils is needed. The shrinking and swelling of the soil can be overcome by backfilling with loam material. For small commercial buildings, slope can be corrected by leveling. For roads and streets, the subgrade needs to be strengthened to overcome low soil strength. Frost action can be controlled by surface drainage and a moisture barrier in the subgrade.

This soil is assigned to capability units IIe-1, dryland, and IIIe-4, irrigated. It is in Silty range site and in windbreak suitability group 3.

Kz—Kezan silt loam, 0 to 2 percent slopes. This is a deep, nearly level, poorly drained soil on flood plains of upland drains and on bottom lands. It is frequently flooded. Areas range from 10 to 160 acres in size.

Typically, the surface layer is mixed grayish brown and light brownish gray, friable silt loam about 6 inches thick. The underlying material in the upper part is mixed grayish brown and brownish gray silt loam. Below that, it is mixed dark gray and grayish brown silt loam, and below that, it is mixed grayish brown and light brownish gray silt loam. The lowest part of the underlying material to a depth of about 60 inches is dark gray silt loam.

Included in mapping are small areas of Judson soils on the lower part of the surrounding foot slopes. Also included are small areas of Hobbs soils in a position on the landscape similar to that of the Kezan soil. The Hobbs soils, however, are only occasionally flooded. The included soils make up about 7 percent of the map unit.

Permeability is moderate. The available water capacity is high. Runoff is slow. The seasonal high water table is at a depth of 1 foot to 2 feet. The content of organic matter is moderate. Natural fertility is high. Tilth is good.

This soil is mainly used as grassland or hayland. In a few small areas, the soil is in cultivated crops.

Under dryland management, this soil is poorly suited to crops, but in some places, small grains and row crops are grown. Wetness and frequent flooding are severe limitations. Wetness makes tillage operations very difficult. Yields can be improved by improving the drainage.

This soil is best suited to use as pasture, rangeland, or hayland. Overgrazing reduces the protective plant cover and causes the desired grasses to decrease. Grazing when the soil is wet can cause the surface soil to become compacted and bogs or small mounds to form. Haying and grazing then become difficult. Deferment of grazing when the soil is wet helps to keep the grasses in good condition.

This soil has good potential as habitat for openland wildlife. Destroying existing habitat should be avoided if

possible. Improving existing habitat or establishing new habitat helps considerably to increase wildlife populations.

This soil is poorly suited to trees and shrubs in windbreaks because of frequent flooding and the seasonal high water table. Only those trees and shrubs that tolerate a high water table and frequent flooding should be planted. Undesirable grasses and weeds that compete with the young trees for moisture and sunlight can be controlled by cultivating between tree rows and by using selective herbicides.

This soil generally is not suited to septic tank absorption fields, sewage lagoons, and sites for buildings because of frequent flooding and the seasonal high water table. Constructing roads on well compacted fill material above flood level and providing adequate side ditches and culverts help to protect the roads from flood damage and wetness. Damage to roads by frost action can be reduced by surface drainage and a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is assigned to capacity unit IVw-7, dryland. It is in Subirrigated range site and in windbreak suitability group 2W.

La—Lamo silty clay loam, 0 to 2 percent slopes. This is a nearly level, somewhat poorly drained soil on bottom lands of the Platte River. This soil is occasionally flooded. Areas are irregular in shape. They range from 5 to 200 acres in size.

Typically, the surface layer is very dark gray, very friable silty clay loam in the upper part and dark gray, friable silty clay loam in the lower part, which extends to a depth of 12 inches. The transition layer is gray, firm silty clay loam about 12 inches thick. The underlying material to a depth of 60 inches is gray silty clay loam. In a few small areas, the surface layer is silt loam.

Included with this soil in mapping are small areas of Gibbon and Ovina soils. Gibbon soils have more sand in the underlying material and are in about the same position on the landscape as Lamo soils. Ovina soils are in higher positions on the landscape and are more sandy than Lamo soils. Also included are a few areas of soils that are saline-alkali. The included soils make up about 5 to 10 percent of the map unit.

Permeability is moderately slow. The available water capacity is high. Runoff is slow. This soil has a seasonal high water table at a depth of about 2 feet in wet years and about 3 feet in dry years. The water table generally is highest in winter and spring. The content of organic matter is moderate, and natural fertility is high. The water intake rate is low. This soil releases moisture readily to plants. Wetness in spring often delays tillage. This soil has a high shrink-swell potential. Reaction is moderately alkaline throughout.

This soil is mainly under cultivation. In a few areas, the soil is in native or introduced grasses that are used for grazing or mowed for hay.

Under dryland management, this soil is suited to corn, grain sorghum, soybeans, and wheat. Excessive wetness caused by the water table or by flooding is the main concern in management because it delays tillage and planting. If suitable outlets are available, open drains help to remove the surface water, and tile drains help to lower the water table. In dry years, the high water table is beneficial to crops in the summer months. Conservation practices, for example, minimum tillage, stripcropping, and stubble mulching, help to prevent soil blowing. Returning crop residue to the soil helps to maintain or improve the content of organic matter. Commercial fertilizers help to maintain high fertility.

Under irrigation, this soil is suited to corn, soybeans, and alfalfa. Tillage commonly is delayed in spring because of wetness and flooding. Tile drains or open ditches can be installed if a suitable outlet is available. Land leveling helps to improve surface drainage and increases the efficiency of irrigation systems. Returning crop residue to the soil and applying fertilizer help to maintain fertility.

Native grasses grow well and are a dependable source of forage in summer. Overgrazing or improper haying methods cause the plant community to deteriorate. The distribution of livestock on rangeland can be improved by correctly locating fences, watering places, and salting facilities. Grazing when the soil is wet can cause compaction.

This soil is suited to use as pasture. Pasture generally consists of bromegrass or a mixture of bromegrass and alfalfa or orchardgrass and alfalfa. Overgrazing or improper haying methods reduce the protective cover and cause the plant population to deteriorate. A grass cover is highly effective in controlling erosion. Proper stocking, rotation grazing, and nitrogen fertilizer help to maintain maximum yields and to keep the grasses in good condition. Timely mowing reduces weed competition.

This soil is suited to trees and shrubs that tolerate a high water table and occasional flooding. Undesirable grasses and weeds are a concern in windbreaks, as they compete with the young trees for moisture and sunlight. Weeds can be controlled by cultivating between rows and by using selective herbicides.

This soil is not suited to septic tank absorption fields, sewage lagoons, or building sites because of flooding and wetness. Frost action, low strength, and flooding are limitations for roads and streets. A gravel moisture barrier in the subgrade and surface drainage help to prevent damage to the road by frost action. Replacing the base material with coarser material helps to increase low soil strength. Side ditches are needed along roads to remove floodwater and lower the water table. Roadbeds can be graded to improve surface drainage.

This soil is assigned to capability units IIw-4, dryland, and IIw-3, irrigated. It is in Subirrigated range site and in windbreak suitability group 2S.

LoC2—Longford silty clay loam, 2 to 6 percent slopes, eroded. This is a deep, gently sloping, well drained soil on convex ridgetops of the loess uplands. Sheet and rill erosion has removed most of the surface layer. The subsoil is mixed with the remaining surface layer during tillage. Small rills and gullies are common after heavy rains. Areas range from 5 to 30 acres in size.

Typically, the surface layer is brown, friable silty clay loam about 6 inches thick. The subsoil is 41 inches thick. The upper part of the subsoil is yellowish brown silty clay loam, the middle part is brown, firm silty clay, and the lower part is pinkish gray, firm silty clay. The underlying material to a depth of 60 inches is pinkish gray silty clay loam.

Included in mapping are small areas of Pawnee soils on lower slopes and small areas of Ponca soils in slightly higher positions. The included soils make up about 10 percent of the map unit.

Permeability is slow. The available water capacity is high. Runoff is medium. The content of organic matter is low, and natural fertility is medium. This soil is somewhat difficult to till because of the high clay content. The shrink-swell potential is high.

Most of the acreage is cultivated. In a few areas, the soil is used as pasture.

Under dryland management, this soil is suited to corn, grain sorghum, soybeans, and wheat. Erosion is the main problem. Small rills and gullies form during heavy rainfall. Grassed waterways and conservation practices, for example, minimum tillage, help to prevent excessive soil loss. Smooth slopes can be terraced and farmed on the contour. Returning crop residue to the soil and adding barnyard manure help to improve fertility and tilth. Adding organic matter also helps to reduce erosion and to increase water infiltration.

This soil is suited to use as pasture. Properly managed grassland is effective in controlling erosion. Poor management, for example, overgrazing and poor grazing rotation, results in compaction, excessive runoff, poor tilth, and erosion. Proper stocking rates and rotation grazing help to keep the soil and grasses in good condition.

The soil is also suited to use as rangeland. Proper grazing use, deferred grazing, and planned grazing systems help to prevent erosion and to maintain the grasses in good condition.

This soil has good potential for habitat for openland and rangeland wildlife. The main hazard to wildlife on this soil is the destruction of habitat, for example, the burning of fence rows, ditchbanks, and crop residue. Preserving or improving existing habitat and establishing new habitat help considerably to increase wildlife populations.

This soil is suited to trees in windbreaks. It is well suited to native trees, coniferous plants, and shrubs. Water erosion is a major hazard. Competition for moisture from grasses and weeds is the main concern in establishing tree seedlings. Planting trees on the contour and cover crops between the rows of trees helps to reduce erosion. Cultivating between the trees and using selective herbicides help to control grasses and weeds. Seedlings and young trees need to be protected from livestock.

The slow permeability is a limitation for septic tank absorption fields. It may be necessary to construct a larger than normal absorption field. Also, because of the slow permeability, effluent may rise to the surface. Lateral seepage or downslope flow is also a problem because of the slope. The slope can be modified by grading. Grading to modify the slope is needed for sewage lagoons. Sewage lagoons need to be lined and sealed to prevent seepage.

Basement walls and foundations need to be designed to withstand the shrinking and swelling of the soil, or excavations can be backfilled with soil material that has a low shrink-swell potential.

Roads and streets need to be designed to overcome the high shrink-swell potential and to compensate for low soil strength. Modification or replacement of the base material for roads can help to reduce the shrink-swell potential and to increase soil strength.

This soil is in capability units IIIe-2, dryland, and IIIe-2, irrigated. It is in Clayey range site and in windbreak suitability group 3.

LoD2—Longford silty clay loam, 6 to 11 percent slopes, eroded. This is a deep, strongly sloping, well drained soil on side slopes of the loess uplands along intermittent drainageways. Sheet and rill erosion have removed most of the surface layer. The remaining surface layer is mixed with the subsoil during tillage. Small rills and gullies are common after heavy rains. This soil has a reddish cast that the surrounding soils do not have. Areas range from 7 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 7 inches thick. The subsoil is about 41 inches thick. The upper part of the subsoil is brown, firm silty clay about 17 inches thick, the middle part is light reddish brown, firm silty clay about 16 inches thick, and the lower part is light brown, firm silty clay about 8 inches thick. The underlying material to a depth of 60 inches is light brown silty clay loam.

Included in mapping are small areas of Burchard and Steinauer soils on lower slopes. The included soils make up about 10 percent of the map unit.

Permeability is slow, and the available water capacity is high. Runoff is rapid. Reaction is slightly acid in the surface layer and subsoil. The content of organic matter is low, and natural fertility is medium. This soil is somewhat difficult to till. The shrink-swell potential is high.

This soil is mainly under cultivation. In most areas, it is used for dryland farming.

This soil is poorly suited to cultivated crops under dryland management. If row crops are grown, erosion is difficult to control. Rills and gullies form easily during

heavy rainfall or rapid snowmelt. Grassed waterways and other conservation practices, for example, minimum tillage, help to prevent soil loss. Returning crop residue to the soil and adding organic fertilizer help to improve fertility and tilth. Adding organic matter helps to reduce erosion. Smooth slopes can be terraced and farmed on the contour.

This soil is suited to use as pasture. Properly managed grassland is effective in preventing erosion. Management that includes rotation grazing, proper stocking, and fertilizing helps to reduce soil compaction, runoff, and erosion.

The soil is also suited to use as rangeland. Proper grazing use, range seeding, and deferred grazing help to keep the soil and plants in good condition.

This soil has good potential for use as habitat for openland and rangeland wildlife. The main threat to wildlife is the destruction of habitat, for example, unnecessary burning of fence rows, ditchbanks, and crop residue. Preserving or improving existing habitat and establishing new habitat help considerably to increase wildlife populations.

This soil is suited to trees and shrubs in windbreaks. It has good potential for native trees, coniferous plants, and shrubs. Water erosion is a major hazard. Competition for moisture from grasses and weeds is the main hindrance to seedling growth. Planting trees on the contour and cover crops between the tree rows helps to reduce erosion. Cultivating between tree rows and using selective herbicides help to control grasses and weeds that may choke out tree seedlings. Seedlings and young trees need to be protected from being eaten or trampled by livestock.

Basement walls and foundations of buildings need to be designed to withstand the shrinking and swelling of the soil, or excavations need to be backfilled with soil material that has a low shrink-swell potential. The low strength of this soil can necessitate special building design.

Slope and slow permeability are limitations for septic tanks and sewage lagoons. The slow permeability can necessitate larger than normal absorption fields for septic tanks and can cause the effluent to rise to the surface. Because of the slope, lateral seepage and downslope flow are hazards if this soil is used for sewage lagoons or septic tank absorption fields. Altering the slope can help prevent seepage.

Because of the low soil strength and the high shrink-swell potential, the soil material may need to be modified or replaced for the construction of roads and streets.

This soil is assigned to capability units IVe-2, dryland, and IVe-2, irrigated. It is in Clayey range site and in windbreak suitability group 3.

MnC—Monona silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, well drained soil on narrow convex ridgetops and side slopes of the loess uplands. In many places, this soil borders upland drains. Areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, very friable silt loam about 7 inches thick. The subsoil is about 27 inches thick. In the upper part, it is brown, friable silt loam; below that, it is pale brown, friable silt loam; below that, it is very pale brown, friable silty clay loam; and in the lower part, it is very pale brown, friable silt loam. The underlying material to a depth of 60 inches is very pale brown silt loam. In a few areas, the soil is more clayey throughout. In some areas, sheet and rill erosion have removed most of the surface layer and there is some mixing of the surface layer with the lighter colored subsoil during tillage.

Included in mapping are a few areas of Hobbs soils along upland drains and Judson soils on colluvial slopes. The included soils make up about 10 percent of the map unit.

Permeability is moderate. The available water capacity is high. The content of organic matter is moderate, and natural fertility is high. Runoff is medium. The water intake rate is moderate. Tilth is good.

This soil is mainly farmed. In a few areas, the soil is in native grasses or is used as pasture.

Under dryland management, this soil is suited to row crops, small grains, and legumes. If this soil is used for cultivated crops, erosion is a hazard. Rills and gullies can form unless conservation practices are used. Conservation practices, including grassed waterways, minimum tillage, contour farming, and terracing on smooth slopes, help to reduce soil loss. Returning crop residue to the soil and regularly adding organic matter help to improve fertility and tilth and to reduce erosion.

This soil is suited to sprinkler irrigation. Planting close-growing crops and careful management of irrigation water help reduce erosion. Conservation tillage practices that return crop residue to the soil, for example, minimum tillage, help to control erosion and add organic matter to the soil.

This soil is suited to use as pasture. Properly managed grassland or grass and legume pasture is effective in preventing erosion. Management practices that include proper stocking and fertilizing help reduce compaction, runoff, and erosion.

The soil is suited to use as rangeland. Proper grazing use, deferred grazing, and planned grazing systems help keep the soil and plants in good condition.

This soil is suited to trees and shrubs in windbreaks. It has good potential for native trees, coniferous plants, and shrubs. Water erosion is a hazard. Competition for moisture from grasses and weeds is the main problem in establishing seedlings. Planting trees on the contour and cover crops between the tree rows helps to reduce erosion. Using selective herbicides and cultivating between the tree rows help to control grasses and weeds. Seedlings and young trees need to be protected from livestock.

This soil has good potential for use as habitat for openland and rangeland wildlife. The main threat to

wildlife on this soil is the destruction of habitat, for example, the burning of fence rows and crop residue. Preserving or improving existing habitat and establishing new habitat help considerably to increase wildlife populations.

This soil is suited to septic tank absorption fields. The slope can be altered to permit construction of sewage lagoons. Sewage lagoons need to be lined with less permeable material to help prevent seepage.

Foundations and basement walls of buildings need to be strengthened to withstand the shrinking and swelling of the soil. Backfilling with coarser soil material or modifying the abutting soil material with additives helps to prevent damage caused by shrinking and swelling. In the more sloping areas, grading to modify the slope is needed for small commercial buildings, and landscaping and erosion control may be needed after construction.

This soil is poorly suited to roads and streets. Frost action is the major hazard, and low strength is a limitation. Installing a moisture barrier in the subgrade helps to prevent damage caused by frost action. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance.

This soil is assigned to capability units IIe-1, dryland, and IIIe-6, irrigated. It is in Silty range site and in windbreak suitability group 3.

MnD2—Monona silt loam, 6 to 11 percent slopes, eroded. This is a deep, strongly sloping, well drained soil on very narrow convex ridgetops and side slopes of the loess uplands. The slopes are either convex or concave. In many places, this soil borders upland drains. Sheet and rill erosion have removed most of the surface layer, and the remaining surface layer is mixed with the subsoil during tillage. Small rills and gullies form readily during heavy rains. Areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is friable silt loam about 22 inches thick. It is brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam. In a few areas, the soil is calcareous nearer the surface.

Included in mapping are a few areas of Hobbs soils along the drains. Also included are a few small areas of Ponca soils on the edge of the mapped areas. The included soils make up about 10 percent of the map unit.

Permeability is moderate. The available water capacity is high. The content of organic matter is moderately low, and natural fertility is medium. Runoff is medium. The water intake rate is moderate. Tilth is good.

Most of this soil is farmed. In a few areas, the soil is in native grasses or is used as pasture.

Under dryland management, this soil is suited to row crops, soybeans, small grains, and alfalfa. If this soil is used for cultivated crops, erosion is a hazard. Sheet erosion and formation of rills and gullies are problems. Grassed waterways and other conservation practices, for example, minimum tillage, contour farming, and terracing on smooth slopes, help to prevent soil loss. Returning crop residue to the soil and systematically adding organic matter help to improve fertility and tilth and to reduce erosion.

This soil is poorly suited to sprinkler irrigation. Rills and gullies form easily. Planting close-growing crops and careful management of irrigation water help to reduce erosion. Returning crop residue to the soil helps conserve moisture and prevent erosion. It also adds organic matter to the soil.

This soil is suited to use as pasture. Properly managed grassland or grass and legume pasture is effective in preventing rill and gully erosion. Poor management, for example, overgrazing and poor grazing rotation, results in compaction, excessive runoff, and erosion.

This soil is suited to use as rangeland. Proper grazing use, deferred grazing, and rotation grazing are management practices that help to keep the soil and plants in good condition.

This soil is suited to trees and shrubs in windbreaks. It has good potential for native trees, coniferous plants, and shrubs. Water erosion is a hazard. Competition for moisture from grasses and weeds is the main hindrance to establishing seedlings. Planting trees on the contour and cover crops between the tree rows can lessen erosion. Using selective herbicides and cultivating between the tree rows help to control grasses and weeds that can choke out seedlings. Seedlings and young trees need to be protected from livestock.

This soil has good potential for use as habitat for openland and rangeland wildlife. The main threat to wildlife on this soil is the destruction of habitat, for example, the burning of fence rows, ditchbanks, and crop residue. Preserving or improving existing habitat and establishing new habitat help considerably to increase wildlife populations.

Downslope flow or lateral seepage of effluent from septic tank absorption fields can be prevented by altering the slope. This soil is not suited to sewage lagoons unless the slope is altered.

Foundations and basement walls of buildings need to be strengthened to withstand the shrinking and swelling of the soil. Backfilling with coarser soil material or modifying the abutting soil material with additives helps to prevent damage caused by shrinking and swelling. Because of the slope, landscaping and erosion control may be needed after construction.

This soil is poorly suited to roads and streets. Frost action is the major hazard, and low strength is a limitation. A gravel moisture barrier in the subgrade helps to prevent damage by frost action. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance.

This soil is assigned to capability units IIIe-1, dryland, and IVe-6, irrigated. It is in Silty range site and in windbreak suitability group 3.

MnE—Monona silt loam, 11 to 17 percent slopes. This is a deep, moderately steep, well drained soil on side slopes that border drainageways, moderately wide divides, and concave side slopes of loess uplands. Areas are elongated and range from 5 to 30 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 11 inches thick. The upper part of the subsoil is dark brown, friable silty clay loam about 6 inches thick, the middle part is brown, friable silty clay loam about 26 inches thick, and the lower part is pale brown, friable, calcareous silt loam about 11 inches thick. The underlying material to a depth of about 60 inches is light brownish gray, calcareous silt loam. In some small areas, calcium carbonates are closer to the surface than is typical.

Included in mapping are small areas of Burchard soils on lower slopes. Also included are small areas of Hobbs soils along the drains. The included soils make up about 5 to 10 percent of this map unit.

Permeability is moderate. The available water capacity is high. Runoff is rapid. Reaction is neutral in the surface layer and the upper and middle parts of the subsoil. The content of organic matter is moderate, and natural fertility is high. The surface layer is easily tilled within a wide range of moisture content.

This soil is mainly used as pasture or for hay. In some places, the soil is cultivated.

This soil is poorly suited to cultivated crops under dryland conditions. Rills and gullies form easily during heavy rains. Erosion is a hazard. Grassed waterways and conservation tillage practices, for example, minimum tillage, can help prevent further soil loss. Smooth slopes can be terraced and farmed on the contour. Returning crop residue to the soil and regularly adding organic fertilizer help to maintain or improve fertility and tilth and to reduce erosion.

This soil generally is not suited to irrigation.

Using this soil as rangeland is effective in controlling wind and water erosion. Overgrazing or improper haying methods reduce the protective cover and cause the potential natural vegetation to deteriorate. Overgrazing can also result in severe soil losses by water erosion. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to maintain or improve the range condition.

This soil is suited to use as pasture. Properly managed grassland or grass and legume pasture is effective in preventing rill and gully erosion. Poor management, for example, overgrazing and poor grazing rotation, results in compaction, excessive runoff, and erosion. Proper grazing use, deferred grazing, and rotation grazing help to keep soil and plants in good condition and help prevent erosion.

This soil has good potential as habitat for openland and rangeland wildlife. Destroying existing habitat should be avoided if possible. Establishing new habitat or improving existing habitat helps considerably to increase wildlife populations.

This soil is suited to trees and shrubs in windbreaks. It has good potential for native trees, coniferous plants, and shrubs. Water erosion is a hazard. Competition for moisture from undesirable grasses and weeds is the main hindrance to establishing tree seedlings. Planting trees on the contour and cover crops between tree rows can lessen erosion. Using selective herbicides and cultivating between the tree rows help to control grasses and weeds that may choke out seedlings. Seedlings and young trees need to be protected from livestock.

This soil is suitable for septic tank absorption fields, but land shaping and contour installation generally are necessary. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Dwellings and small buildings need to be designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage caused by the moderate shrinking and swelling of the soil.

Frost action and erosion are the major hazards to roads and streets, and low strength is the main limitation. The road base needs to be designed to reduce frost action. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance.

This soil is assigned to capability unit IVe-1, dryland. It is in Silty range site and in windbreak suitability group 3.

MnF—Monona silt loam, 17 to 30 percent slopes. This is a deep, steep, somewhat excessively drained soil on side slopes that border drainageways, moderately wide divides, and concave side slopes of the loess uplands. Areas are elongated and range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 13 inches thick. The subsoil is yellowish brown, friable silt loam about 29 inches thick. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam.

Included in mapping are small areas of Burchard soils along the lower slopes and small areas of Hobbs soils that are adjacent to the drainageways. The included soils make up about 5 to 10 percent of this map unit.

Permeability is moderate. The available water capacity is high. Runoff is rapid. Reaction is neutral in the surface layer and subsoil. The content of organic matter is moderate, and natural fertility is high.

Most of the acreage is in native trees. This soil is used as rangeland, but the grasses are sparse and unproductive because they are shaded by the trees.

This soil generally is not suited to cultivated crops because of steepness and because erosion is a very severe hazard.

The soil is suited to use as pasture. Properly managed grassland or grass and legume pasture is effective in preventing erosion. Poor management, for example, overgrazing and poor grazing rotation, results in soil compaction, excessive runoff, and erosion.

This soil is suited to use as rangeland. Proper grazing use, deferred grazing, and rotation grazing help to keep the soil and plants in good condition. Brush control reduces plant competition and helps to improve the vigor of the grasses.

This soil has good potential for use as habitat for rangeland and woodland wildlife (fig. 12). A variety of plants that provide cover and food for wildlife grow on this soil. The main threat to wildlife is destruction of the habitat.

This soil generally is not suited to trees and shrubs in windbreaks. It is too steep for the use of machinery in windbreak planting or care of windbreaks to be practical. Erosion is a very severe problem if this soil is tilled. Onsite evaluation is needed to determine if the soil in some areas can be planted to trees and shrubs by hand.

This soil is too steep for installation of septic tank absorption fields and sewage lagoons. It is also too steep for use as sites for building. Substitute sites need to be considered for these uses.

Extensive cuts and fills generally are needed to provide a suitable grade for roads, which need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Replanting exposed or disturbed soil after construction helps to control erosion. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is assigned to capability unit VIe-1, dryland. It is in Silty range site and in windbreak suitability group 10.

Mu—Muir silt loam, 0 to 1 percent slopes. This is a deep, well drained, nearly level soil on stream terraces. The soil is rarely flooded. Areas generally are long and fairly broad. They range from 40 to 300 acres in size.

Typically, the surface layer is dark gray, very friable silt loam in the upper part, dark gray, friable silt loam in the middle part, and gray, friable silt loam in the lower part. It is about 20 inches thick. The subsoil is friable silt loam

Figure 12.—Entrenched channels bordered by native trees on Monona silt loam, 17 to 30 percent slopes.

about 16 inches thick. It is brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is pale brown silt loam. In a few small areas, the surface layer and the upper part of the subsoil are silty clay loam.

Included in mapping are small areas of Grigston soils that are adjacent to old drains where the hazard of flooding has lessened. In some areas, the soils have more clay in the subsoil and are in lower positions on the landscape than the Muir soil. The included soils make up about 10 percent of the map unit.

Permeability is moderate. The available water capacity is high. Runoff is slow. Natural fertility is high, and the content of organic matter is moderate. The surface layer is easily tilled within a wide range of moisture content. This soil releases moisture readily to plants. The water intake rate is moderate. Reaction is neutral throughout. Tilth is good.

Nearly all the acreage is used for cultivated crops.

Under dryland management, this soil is suited to corn, soybeans, grain sorghum, and wheat. It is suited to grasses and alfalfa for pasture and hay crops, but it is seldom used for this purpose. This soil has few hazards or limitations. It is one of the more productive soils in the county. Conservation practices, for example, minimum tillage, stripcropping, and stubble mulching, help to prevent soil blowing and loss of soil moisture by evaporation. Returning crop residue to the soil helps to maintain or improve the content of organic matter and fertility. Commercial fertilizers and barnyard manure help to maintain high fertility.

Most of this soil is irrigated. Under irrigation, it is suited to corn, soybeans, grain sorghum, and alfalfa. Land leveling increases the efficiency of irrigation systems. Crops respond well to commercial fertilizer. Minimum tillage and other conservation practices help to prevent soil blowing and loss of soil moisture by evaporation. Practices that leave crop residue on the surface also add organic material to the soil.

This soil is suited to trees and shrubs in windbreaks. Drought and competition for moisture from weeds and grasses are concerns in management. Competition from weeds and grasses can be eliminated by mechanical cultivation between tree rows or by hand hoeing or using selective herbicides in tree rows.

This soil is suited to septic tank absorption fields, but protection against flooding is needed. Sewage lagoons need to be lined or sealed to prevent seepage.

Dwellings and buildings can be constructed on elevated and well compacted fill material as protection against flooding. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance.

This soil is assigned to capability units I-1, dryland, and I-6, irrigated. It is in Silty Lowland range site and in windbreak suitability group 1.

MuB—Muir silt loam, 1 to 3 percent slopes. This is a deep, well drained, very gently sloping soil on stream terraces and concave foot slopes at the base of upland slopes. The soil is rarely flooded. During heavy rainstorms, some water flows over areas of this soil for brief periods, but the resulting damage is slight. Areas generally are long and fairly broad. They range from 20 to 200 acres in size.

Typically, the upper part of the surface layer is very dark grayish brown, very friable silt loam about 6 inches thick. The lower part of the surface layer is dark grayish brown, very friable silt loam about 8 inches thick. The subsoil is friable silty clay loam 36 inches thick. The upper part of the subsoil is brown, the middle part is pale brown, and the lower part is very pale brown. The underlying material to a depth of about 60 inches is very pale brown silt loam. In a few small areas, the subsoil is coarser. In some areas, the dark surface layer is thinner and there is more sand in the underlying material.

Permeability is moderate. The available water capacity is high. The content of organic matter is moderate. Natural fertility is high. This soil releases moisture readily to plants. Tilth is good, and the soil is easily tilled within a wide range of moisture content. The water intake rate is moderate.

Nearly all the acreage is used for cultivated crops. Crops are grown under dryland and irrigation management.

Under dryland management, this soil is suited to corn, soybeans, wheat, and alfalfa. If this soil is used for cultivated crops, water erosion is a slight hazard. Minimum tillage, stubble mulching, and other practices that leave crop residue on or near the surface help to prevent erosion and to conserve soil moisture and to maintain or improve fertility, tilth, and the content of organic matter. Commercial fertilizers help to maintain high fertility.

Most of this soil is irrigated. Under irrigation, it is suited to corn, soybeans, grain sorghum, and alfalfa. Land leveling helps to increase the efficiency of irrigation systems. Crops respond well to commercial fertilizers. Conservation practices, for example, minimum tillage, help to prevent soil blowing and loss of soil moisture by evaporation, and also add organic matter to the soil and improve fertility and tilth.

Very little of the acreage is used as pasture or rangeland. This soil is suited to use as pasture of tame grasses. The main concern in management is overgrazing.

This soil is suited to trees and shrubs in windbreaks. Competition for moisture is the main concern in management. Preparing a well cultivated seedbed that is free of weeds and grasses reduces plant competition. Preemergence herbicides help to control weeds.

The soil is suited to septic tank absorption fields, but protection against flooding is needed. Sewage lagoons need to be diked against flooding. The base of the lagoon needs to be compacted and sealed or lined to prevent seepage.

Houses and buildings can be constructed on elevated and well compacted fill material as protection against flooding. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance.

This soil is assigned to capability units IIe-1, dryland, and IIe-6, irrigated. It is in Silty Lowland range site and in windbreak suitability group 3.

Ob—Olbut-Butler silt loams, 0 to 1 percent slopes. This map unit consists of deep, nearly level, somewhat poorly drained soils in shallow depressions and slight swales on broad, flat areas of the loess uplands. Water ponds on the surface occasionally in some low areas. These soils contain appreciable amounts of salts.

The Olbut soil is at a slightly lower elevation than the Butler soil. These soils are in areas that are too closely intermingled or too small to be shown separately on the map. The mapped areas are about 55 to 65 percent Olbut soil and 25 to 35 percent Butler soil and range from 5 to 300 acres in size.

Typically, the surface layer of the Olbut soil is gray, friable silt loam about 6 inches thick. The upper part of the subsoil is dark gray, firm silty clay about 8 inches thick. The middle part is grayish brown, firm, calcareous silty clay that has many fine white salt accumulations and is about 6 inches thick. The lower part is light brownish gray, mottled, calcareous silty clay loam that has many fine white salt accumulations and is about 9 inches thick. The upper part of the underlying material is light gray, mottled, calcareous silty clay loam that has many medium white salt accumulations. The lower part to a depth of 60 inches is light gray, mottled, calcareous silt loam that has many medium white salt accumulations.

Typically, the surface layer of the Butler soil is dark gray, friable silt loam about 14 inches thick. The upper part of the subsoil is very dark grayish brown, very firm silty clay about 10 inches thick. The middle layer of the subsoil is dark grayish brown, mottled, very firm silty clay about 11 inches thick. The lower part of the subsoil is light brownish gray, mottled, friable silty clay loam about 5 inches thick. The underlying material to a depth of 60 inches is light gray, mottled, calcareous silt loam.

Included in mapping are small areas of Fillmore and Hastings soils, which are intermixed in such a complex pattern that they cannot be mapped separately. Also included are small areas of slick spots. The included soils make up 5 to 20 percent of the map unit.

Permeability is slow, and the water intake rate for irrigation is low. Runoff is slow. The seasonal high water table ranges from 6 inches above the surface to 3 feet below the surface in the Olbut soil and is at a depth of 6 inches to 3 feet in the Butler soil. In the Olbut soil, natural fertility is low, and the content of organic matter is moderately low. In the Butler soil, natural fertility is high, and the content of organic matter is moderate. The Butler soil is slightly acid to moderately alkaline in the subsoil and strongly alkaline in the underlying material. The Olbut soil is slightly to moderately affected by soluble salts and by exchangeable sodium. Tilth of the Olbut soil is poor.

These soils are mainly cultivated. In a few places, the soils are used as pasture.

Under dryland management, these soils are poorly suited to corn, wheat, soybeans, and grain sorghum. The main concerns are poor drainage and the content of soluble salts and exchangeable sodium, which can cause poor tilth and restricted movement of water, air, and roots in the soil. These soils tend to be droughty because water infiltrates slowly. In places where salts have accumulated, seed germination is poor, plants are stunted, and grain is of poor quality. Adequate drainage and chemical amendments help to improve saline-alkali conditions.

Under irrigation management, these soils are poorly suited to corn, grain sorghum, wheat, and soybeans because of the saline-alkali conditions. The same procedures that are used in dryland management are also used in irrigation management. Irrigation water can be used to help leach salts from the soil.

These soils are suited to use as pasture. Overgrazing or grazing when the soil is too wet results in surface compaction and poor tilth. Proper stocking, rotation grazing, and fertilizing help to keep the plants and soil in good condition. Only those grasses that are adapted to wetness and saline-alkali conditions should be planted.

These soils are poorly suited to trees and shrubs in windbreaks. Wetness, saline-alkali conditions, and soil cracking caused by the shrinking and swelling of the soil are the main problems. To cope with wetness, drainage systems can be constructed and trees that tolerate occasional ponding and wetness can be planted. Soil cracking allows air to dry out roots of newly established seedlings. Supplemental irrigation and light cultivation help to control soil cracking. Only those trees and shrubs that tolerate somewhat poor drainage and saline-alkali conditions should be planted. Weeds can be controlled by mechanical cultivation between the tree rows, by hand hoeing or rototilling around trees, and by appropriate herbicides.

These soils are not suited to septic tank absorption fields because of the slow permeability. These soils are poorly suited to sewage lagoons because of ponding and seepage. Lagoons can be diked against ponding and lined with less permeable material to prevent seepage.

These soils are poorly suited to use as sites for dwellings and commercial buildings because of the high shrink-swell potential, ponding, and wetness. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage caused by the shrinking and swelling. Buildings can be constructed on elevated and well compacted fill material as protection from ponding and wetness.

These soils are poorly suited to local roads and streets because of wetness, ponding, low soil strength, the shrink-swell potential, and frost action. Roads and streets need to be designed so that the pavement and the subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance. Additives can be mixed with the soils to help control the shrinking and swelling. Damage to roads by frost action can be reduced by surface drainage and a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

These soils are assigned to capability units IIIs-1, dryland, and IIIs-2, irrigated. The Olbut soil is in Saline Lowland range site, and the Butler soil is in Clayey range site. The Olbut soil is in windbreak suitability group 9S, and the Butler soil is in windbreak suitability group 2W.

OvB—Ovina loamy fine sand, 0 to 3 percent slopes. This is a deep, nearly level and very gently sloping, somewhat poorly drained soil on bottom lands. Areas of this soil are large and irregular in shape. The areas range from 20 to several hundred acres in size.

Typically, the surface layer is about 21 inches thick. The upper part is very dark grayish brown, very friable loamy fine sand, and the lower part is mixed gray and light brownish gray, calcareous, very friable fine sandy loam. The transition layer is about 8 inches thick. It is gray, friable, calcareous loam in the upper part and gray, very friable, calcareous fine sandy loam in the lower part. The underlying material is light gray, calcareous, fine sandy loam in the upper part, light grayish brown, calcareous loam in the middle part, and gray, calcareous loam in the lower part, to a depth of 60 inches.

Included with this soil in mapping are small areas of Gibbon soils that are in low-lying positions. Also included are some small areas of soils that have loamy sand as underlying material. The included soils make up about 10 percent of the map unit.

Permeability is moderately rapid, and the water intake rate is high. Runoff is slow. The available water capacity is moderate. Natural fertility is medium. The content of organic matter is moderately low. The seasonal high water table is at a depth of 1 foot to 3 feet. Reaction is neutral to moderately alkaline in the surface and transition layers and mildly alkaline or moderately alkaline in the underlying material. This soil is easily tilled within a wide range of moisture content.

Nearly all of the acreage is cultivated. In a few small areas, the soil is used as rangeland.

Under dryland management, this soil is suited to corn and grain sorghum. The main hazard is wind erosion. Conservation practices that include minimum tillage and stripcropping help to prevent wind erosion and to conserve moisture. Returning crop residue to the soil helps to maintain the content of organic matter and fertility. Commercial and organic fertilizers help to increase yields.

In most places, this soil can be irrigated. Under irrigation, the soil is suited to corn, soybeans, grain sorghum, and alfalfa. A minor amount of leveling helps to improve the distribution of surface water and to increase the efficiency of irrigation systems. Careful management of irrigation water is needed because of the moderate water-holding capacity. Returning crop residue to the soil helps to increase the content of organic matter and improve fertility.

Using this soil as rangeland, for either grazing or haying, is effective in controlling soil blowing. Overgrazing or improper haying methods reduce the protective cover and cause the potential plant community to deteriorate. Overgrazing when the soil is wet can result in surface compaction and the formation of small mounds. Grazing and haying then become difficult. Proper grazing use, timely deferment of grazing or haying, and restricted grazing in very wet periods help to maintain the plant community in good condition.

This soil is suited to trees and shrubs in windbreaks, but only those trees that tolerate a high water table should be planted. Seedlings need to be protected from livestock. Using herbicides and cultivating between tree rows help to control grasses and forbs that can choke out the seedlings.

This soil is poorly suited to septic tank absorption fields, sewage lagoons, and other sanitary facilities because of seepage, wetness, and the risk of polluting the ground water. Sewage lagoons need to be lined with less permeable material. Lagoons also need to be elevated above the water table, or the site needs to be drained. Septic tank absorption fields need to be constructed on fill material well above the water table, or perimeter drains can be installed around the field. For buildings, surface and subsurface drainage can be provided to overcome soil wetness. Frost action is a hazard to roads and streets, but it can be reduced by a moisture barrier in the subgrade and surface drainage.

This soil is assigned to capability units IIIw-5, dryland, and IIIw-10, irrigated. It is in Subirrigated range site and in windbreak suitability group 2S.

OxC—Ovina-Thurman loamy fine sands, 0 to 6 percent slopes. This map unit consists of nearly level to gently sloping, somewhat poorly drained and somewhat excessively drained soils on hummocky parts of the stream terraces of the Platte River. The Ovina soil is in lower positions on the landscape, and the Thurman soil is in higher positions. The soils are in areas too closely intermingled to be mapped separately. The mapped areas are about 35 to 55 percent Ovina soil and 30 to 50 percent Thurman soil and range from 40 to 300 acres in size.

Typically, the surface layer of the Ovina soil is dark gray, very friable loamy fine sand about 8 inches thick. The subsurface layer is loose, grayish brown, calcareous loamy fine sand about 12 inches thick. In the upper part, the underlying material is gray, calcareous fine sandy

loam; below that, it is gray, calcareous loam; below that, it is grayish brown, calcareous loam; and below that, it is light gray, calcareous fine sandy loam. The lower part of the underlying material to a depth of about 60 inches is light gray, calcareous loamy fine sand. The seasonal high water table is at a depth of 1 foot to 3 feet.

Typically, the surface layer of the Thurman soil is loose, very dark brown loamy fine sand about 7 inches thick. The subsurface layer is dark gray, very friable loamy fine sand about 11 inches thick. The transition layer is grayish brown, very friable loamy fine sand about 7 inches thick. The underlying material to a depth of about 60 inches is pale brown fine sand.

Included in mapping are small areas of Gibbon, Cozad, and Zook soils and of soils that have a sandy surface layer and a silty subsoil. Gibbon and Zook soils are in slightly lower positions than the Ovina soil. Cozad soils and the soils that have a sandy surface layer over a silty subsoil generally are in slightly lower positions on the landscape than the Thurman soil. The included soils make up 15 to 25 percent of the map unit.

Permeability is moderately rapid in the Ovina soil and rapid in the Thurman soil. The available water capacity is moderate in the Ovina soil and low in the Thurman soil. Runoff is slow. Natural fertility is medium in the Ovina soil and low in the Thurman soil. The content of organic matter is moderately low. The water intake rate is moderate for the Ovina soil and high for the Thurman soil. The Thurman soil is easily tilled within a wide range of moisture content. Because the water table in the Ovina soil is at a depth of 1 foot to 3 feet from late in spring until late in fall, this soil is somewhat difficult to till because of wetness.

Almost all the acreage is farmed. The soils are used as rangeland in only a few small areas.

Under dryland management, these soils are suited to wheat, grain sorghum, and alfalfa. The major hazard is wind erosion, and the main limitation is droughtiness. Soil blowing can be controlled by conservation methods, including stripcropping, stubble mulching, and minimum tillage. Returning crop residue to the soil helps to improve tilth and fertility.

Under irrigation, these soils are suited to corn, sorghum, soybeans, and alfalfa. The main problem is soil blowing. Minimum tillage and other conservation tillage systems that leave crop residue on the surface help to control soil blowing, increase the content of organic matter, and improve fertility. Because of the hummocky topography, sprinkler irrigation works best to achieve even distribution of water.

Using these soils as rangeland, for either grazing or haying, is effective in controlling soil blowing. Overgrazing or improper haying methods reduce the protective plant cover and cause the potential natural vegetation to deteriorate. When the Ovina soil is wet, overgrazing can result in surface compaction and the formation of small mounds. Grazing and hay harvesting then become difficult. Proper grazing use, timely deferment of grazing or haying, and restricted grazing in very wet periods help to maintain the plant community in good condition.

These soils are suited to trees and shrubs in windbreaks. The main hindrance to establishing tree seedlings is competition from weeds and undesirable grasses. Cultivating between tree rows and using selective herbicides help to control grasses and forbs that may choke out seedlings. Seedlings and young trees need to be protected from livestock. Only those trees that tolerate occasional wetness should be planted on the Ovina soil.

These soils are poorly suited to use as sites for sanitary facilities. On the Ovina soil, septic tank absorption fields and sewage lagoons need to be constructed on fill material well above the high water table. On the Thurman soil, nearby water supplies may be contaminated by seepage from the absorption field. Sewage lagoons on these soils need to be lined or sealed to prevent seepage. On the Ovina soil, buildings need to be constructed on raised and well compacted fill material to overcome wetness. The Thurman soil is suited to use as sites for buildings. Damage to roads caused by frost action on the Ovina soil can be reduced by surface drainage and by a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. The Thurman soil is suited to roads and streets.

These soils are assigned to capability units IIIe-6, dryland, and IIIe-10, irrigated. The Ovina soil is in Subirrigated range site, and the Thurman soil is in Sandy range site. The Ovina soil is in windbreak suitability group 2S, and the Thurman soil is in windbreak suitability group 5.

PaC2—Pawnee clay loam, 3 to 6 percent slopes, eroded. This is a deep, gently sloping, moderately well drained soil on convex ridgetops on uplands. Sheet and rill erosion have removed most of the surface layer, and the remaining surface layer is mixed with the subsoil during tillage. The mapped areas are irregular in shape and range from 10 to 80 acres in size.

Typically, the surface layer is dark grayish brown and dark gray, friable clay loam about 9 inches thick. The upper part of the subsoil is very firm, grayish brown clay about 13 inches thick. The second layer of the subsoil is brown, very firm clay about 8 inches thick, and the third layer is yellowish brown, very firm clay about 8 inches thick. The lower part of the subsoil is light yellowish brown, very firm clay loam that has common coarse distinct strong brown mottles. It is about 7 inches thick. The underlying material to a depth of 60 inches is pale yellow clay loam. In some small areas, the soil has a reddish tint.

Included in mapping are small areas of Longford, Ponca, and Sharpsburg soils on the broader and higher parts of divides. The included soils make up about 10 percent of the map unit.

Permeability is slow. The available water capacity is high. Runoff is rapid. This soil shrinks and swells markedly because of the high content of clay in the subsoil, and large cracks form as the soil dries. In spring, a perched water table is at a depth of 1 foot to 3 feet. Reaction is medium acid to neutral in the surface layer and in the upper and middle parts of the subsoil and moderately alkaline below that. Natural fertility is medium, and the content of organic matter is moderately low. The surface layer is difficult to till, and the subsoil is difficult for plant roots to penetrate.

In most areas, this soil is cultivated. In a few small areas, it is used as pasture or range.

Under dryland management, erosion is a hazard. The high content of clay in the subsoil retards the movement of water through the soil. The slow permeability and the slope cause rapid runoff and formation of rills and gullies during heavy rains. Conservation practices, for example, grassed waterways and minimum tillage, help to prevent further soil loss. Smooth slopes can be terraced and farmed on the contour. Returning crop residue to the soil and regularly adding organic fertilizer help to improve fertility and tilth and to reduce erosion.

This soil is suited to use as pasture. Properly managed grassland or grass and legume pasture is effective in preventing erosion. Poor management, including overgrazing, results in surface compaction, excessive runoff, and erosion. Gullies and rills can result from erosion.

Using this soil as rangeland is effective in controlling wind and water erosion. Overgrazing or improper haying methods reduce the protective plant cover and cause the potential natural vegetation to deteriorate. Overgrazing can result in severe soil loss by water erosion. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to maintain or improve the range condition.

This soil is poorly suited to trees and shrubs in windbreaks. Because of the high content of clay, the subsoil is difficult for roots to penetrate. Only those trees and shrubs that tolerate droughtiness should be planted.

This soil is not suited to septic tank absorption fields because of the slow permeability. A substitute site is needed. For sewage lagoons, grading is required to modify the slope and shape the lagoon. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the high shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Surface drainage can reduce damage to roads and streets by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to prevent the shrinking and swelling.

This soil is assigned to capability unit IVe-4, dryland. It is in Dense Clay range site and in windbreak suitability group 4C.

PaD2—Pawnee clay loam, 6 to 11 percent slopes, eroded. This is a strongly sloping, moderately well drained upland soil along intermittent drainageways on short, convex upper slopes. Sheet and rill erosion have removed most of the surface layer, and the remaining surface layer is mixed with the subsoil during tillage. Areas range from 8 to 100 acres in size.

Typically, the surface layer is dark grayish brown, firm clay loam in the upper part and grayish brown, firm clay loam in the lower part. The surface layer is about 10 inches thick. The upper part of the subsoil is pale brown, firm clay about 12 inches thick. The lower part of the subsoil is light yellowish brown, mottled, firm clay about 17 inches thick. The underlying material to a depth of 60 inches is light yellowish brown, mottled, calcareous clay loam. In some areas, the soil has redder hues than are prescribed in the range of Pawnee soils.

Included in mapping are small areas of Longford, Ponca, and Sharpsburg soils in higher positions on the landscape and small areas of Steinauer soils in lower positions on the landscape. The included soils make up about 10 percent of the map unit.

Permeability is slow. The available water capacity is high. Runoff is rapid. The shrink-swell potential is high, and large cracks form as the soil dries. In spring, the water table is at a depth of 1 foot to 3 feet. Reaction is neutral in the surface layer and in the upper and middle parts of the subsoil and moderately alkaline below that. Natural fertility is medium, and the content of organic matter is moderately low. The surface layer is difficult to till, and the subsoil is difficult for plant roots to penetrate.

Most of the acreage is farmed. In some areas, the soil is used as pasture or range.

Under dryland management, this soil is suited to wheat, grain sorghum, grasses, and legumes. The high content of clay in the subsoil retards permeability and increases surface runoff, causing rills and gullies to form during heavy rains. Grassed waterways, minimum tillage, and other conservation practices help to prevent soil loss. Smooth slopes can be terraced and farmed on the contour. Returning crop residue to the soil and regularly adding organic fertilizer help to improve fertility and tilth and to reduce erosion.

This soil is suited to use as pasture. Pasture generally is bromegrass or a mixture of bromegrass and alfalfa or orchardgrass and alfalfa. Overgrazing or improper haying methods reduce the protective plant cover and cause the plant population to deteriorate. A grass cover is highly effective in controlling erosion. Proper stocking, rotation grazing, and nitrogen fertilizer help to maintain maximum yields and keep the grasses in good condition. Timely mowing reduces weed competition.

Using this soil as rangeland is effective in controlling wind and water erosion. Overgrazing or improper haying methods reduce the protective plant cover and cause the potential natural vegetation to deteriorate. Overgrazing can also result in severe soil loss by water erosion. Proper grazing use, timely deferment of grazing

or haying, and a planned grazing system help to maintain or improve the range condition.

This soil is poorly suited to trees and shrubs in windbreaks. Because of the high content of clay, the subsoil is difficult for roots to penetrate. Only those trees and shrubs that tolerate droughtiness should be planted. Planting trees on the contour helps to conserve moisture and to reduce runoff and erosion.

This soil is not suited to septic tank absorption fields because of the slow permeability. For sewage lagoons, grading is required to modify the slope and shape the lagoon. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the high shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Surface drainage can reduce damage to roads and streets by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to prevent the shrinking and swelling.

This soil is assigned to capability unit IVe-4, dryland. It is in Dense Clay range site and in windbreak suitability group 4C.

Pg—Pits, gravel. This miscellaneous area consists of pits, which commonly are ponded, and the adjacent mounds of gravel, sand, and overburden. The sand and gravel are stockpiled to be used in construction and as fill material. Areas range from 5 to 80 acres in size.

Typically, the material in the areas of this map unit is a mixture of fine, medium, and coarse sand and varying amounts of gravel. There is no development of a soil profile.

Included in mapping are small areas of Barney, Boel, and Inavale soils. The included soils make up about 5 to 10 percent of the map unit.

Permeability is very rapid. The available water capacity is low. The content of organic matter is low, and natural fertility is low. The areas of sand generally support no plant life except where they are no longer used as a source of sand and gravel. Runoff is slow or very slow.

Only about one-third of the acreage of these pits is used for commercial mining of sand and gravel. The rest consists of abandoned pits that have poor potential for agricultural use.

The material in the areas of this map unit is not suited to cultivated crops because of the coarse texture, the low available water capacity, and the steepness of slopes.

Some of the abandoned pits are suited to use as habitat for wildlife. Where the pits are no longer mined, sparse vegetation gradually becomes established. Trees and shrubs that are tolerant of droughty conditions can be hand planted. Redcedar, pine, cottonwood, and green ash are the best trees for individual or scattered plantings. Trees need special care after planting if they are to survive. A cover of native grasses or wooden barriers help to protect the trees from blowing sand. New plantings may need supplemental watering to keep the young trees alive.

Many of these abandoned gravel pits are used as recreation sites for fishing, swimming, or duck hunting. In some places, vacation cabins or summer homes have been built near these pits.

The material in these areas generally is not suited to septic tanks or sewage lagoons. A substitute site is needed. This defect and the hazard of flooding severely limit the use of these areas for home or cabin sites.

This map unit is assigned to capability unit VIIIs-8, dryland. It is in windbreak suitability group 10.

PoC2—Ponca silty clay loam, 2 to 6 percent slopes, eroded. This is a deep, gently sloping, well drained soil on narrow ridgetops and upper side slopes of the loess uplands. Erosion on this soil has not been uniform. In most areas of this soil, however, the surface layer is lighter colored than in uneroded Ponca soils. Most of the surface layer has been removed by erosion, and the remaining surface layer is mixed with the subsoil during tillage. Rills are common after heavy rains. Areas generally are long and narrow and range from 5 to 40 acres in size.

Typically, the surface layer is pale brown, friable silty clay loam about 6 inches thick. The subsoil is very pale brown, friable silty clay loam about 16 inches thick that has strong brown mottles. The upper part of the underlying material is gray, mottled silty clay loam about 6 inches thick. The lower part to a depth of 60 inches is light gray, mottled silt loam. In some areas, the depth to lime is more than 25 inches. In some small areas, the surface layer is loam.

Included in mapping are small areas of Sharpsburg soils at a higher elevation. These included soils make up about 10 percent of the map unit.

Permeability is moderate. The available water capacity is high. Runoff is moderate. The content of organic matter is moderately low, and natural fertility is medium. The water intake rate is moderate. This soil is easily tilled within a moderately wide range of moisture content.

This soil is mainly cultivated. In some small areas, the soil is in pasture.

Under dryland management, this soil is suited to corn, grain sorghum, small grains, and alfalfa. Erosion is a hazard. Grassed waterways, minimum tillage, contour farming, terracing, and other conservation practices can reduce erosion. Returning crop residue to the soil also helps to protect the soil from erosion, conserve the supply of moisture, and add organic matter. Organic fertilizer helps to improve fertility.

Under irrigation, a sprinkler system is best suited. If gravity irrigation is used, the soil can be bench-leveled or crops can be planted on the contour. This soil erodes easily, so measures to prevent erosion are needed.

Close-growing crops help to prevent erosion. Conservation practices that keep crop residue on the surface are especially beneficial.

This soil is suited to use as pasture of introduced grasses and legumes. A grass cover is effective in controlling erosion. Overgrazing or improper haying methods reduce the protective cover and cause the stand of grasses to deteriorate. Overgrazing can result in severe water erosion. Proper stocking and rotation grazing help to maintain or improve the pasture. Fertilizing with nitrogen helps to increase yields.

This soil is suited to native grasses; generally it is not used as rangeland.

This soil is suited to trees and shrubs in windbreaks. Water erosion is a hazard. Competition for moisture from grasses and weeds is a concern in establishing seedlings. Planting trees on the contour and cover crops between the tree rows helps to prevent erosion. Using selective herbicides and cultivating between the rows help to control undesirable grasses and weeds. Seedlings and young trees need to be protected from livestock.

This soil is suited to septic tank absorption fields. Sewage lagoons need to be lined or sealed to prevent seepage. Also, grading is required to modify the slope and shape the lagoon. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage by the moderate shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance. Damage to roads and streets by frost action can be reduced by surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is assigned to capability units IIe-1, dryland, and IIIe-6, irrigated. It is in Silty range site and windbreak suitability group 3.

PoD2—Ponca silty clay loam, 6 to 11 percent slopes, eroded. This is a deep, strongly sloping, well drained soil along intermittent drainageways on uneven side slopes of the loess uplands. Sheet and rill erosion have removed most of the surface layer, and the rest is mixed with the subsoil during tillage. The areas are dissected by numerous small rills and gullies. They range from 5 to 100 acres in size.

Typically, the surface layer is grayish brown, friable silty clay loam about 7 inches thick. The upper part of the subsoil is pale brown, friable silty clay loam about 8 inches thick, and the lower part is light brownish gray silty clay loam about 7 inches thick. The upper part of the underlying material is light gray, calcareous, friable silt loam about 9 inches thick, and the lower part to a depth of 60 inches is very pale brown, calcareous silt loam. In some places, the depth to lime is more than 25 inches.

Included in mapping are small areas of Burchard soils on lower slopes and small areas of Crofton soils on more exposed and convex slopes. The included soils make up about 5 to 10 percent of this map unit.

Permeability is moderate. The available water capacity is high. Runoff is rapid. The content of organic matter is moderately low, and natural fertility is medium. The water intake rate is moderate. This soil is easily tilled within a moderately wide range of moisture content. The shrink-swell potential is moderate.

Almost all of the acreage is cultivated. The rest is used as pasture or range.

Under dryland management, this soil is suited to corn, soybeans, small grains, and alfalfa. Erosion is a hazard. Grassed waterways and conservation practices that include minimum tillage, contour farming, and terracing on smooth slopes help prevent sheet erosion and the formation of gullies. Returning crop residue to the soil and regularly adding organic matter improve fertility and tilth and reduce erosion.

This soil is poorly suited to sprinkler irrigation. Close-growing crops and careful management of irrigation water help to reduce erosion.

This soil is suited to use as pasture. Pasture generally is bromegrass or a mixture of bromegrass and alfalfa or orchardgrass and alfalfa. Overgrazing or improper haying methods reduce the protective cover and cause the plant population to deteriorate. A grass cover is highly effective in controlling erosion. Proper stocking, rotation grazing, and nitrogen fertilizer help to maintain maximum yields and to keep the grasses in good condition. Timely mowing reduces weed competition.

This soil is suited to use as range. Proper range use, deferred grazing, and rotation grazing help to keep the soil and the plant cover in good condition.

This soil is suited to trees and shrubs in windbreaks. It has good potential for native trees, conifers, and shrubs. Water erosion is a hazard. Competition for moisture from undesirable grasses and weeds is the main concern in establishing tree seedlings. Planting trees on the contour and cover crops between the tree rows helps to lessen erosion. Using selective herbicides and cultivating between tree rows help to control grasses and weeds. Seedlings and young trees need to be protected from livestock.

This soil has good potential as habitat for openland and rangeland wildlife. The main threat to wildlife is the destruction of habitat, for example, the burning of fence rows, ditchbanks, and crop residue. Preserving or improving existing habitat and establishing new habitat help considerably to increase wildlife populations.

This soil is suitable for septic tank absorption fields, but land shaping and contour installation generally are needed. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Dwellings and small commercial buildings need to be properly designed to accommodate the slope, or

the soil can be graded to an acceptable gradient. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage caused by the moderate shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser material can be used for subgrade or base material to ensure better performance. Damage to roads and streets by frost action can be reduced by surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is assigned to capability units IIIe-8, dryland, and IVe-6, irrigated. It is in Silty range site and in windbreak suitability group 3.

PoE2—Ponca silty clay loam, 11 to 17 percent slopes, eroded. This is a deep, moderately steep, well drained soil on convex side slopes of the loess uplands. Rill and gully erosion have removed most of the surface layer, and the remainder is mixed with the subsoil during tillage. Rills and gullies form easily during heavy rains. Areas are irregular in shape and range from 5 to 130 acres in size.

Typically, the surface layer is pale brown, friable silty clay loam about 4 inches thick. The subsoil is very pale brown, friable silty clay loam about 14 inches thick. The underlying material to a depth of 60 inches is very pale brown, friable, calcareous silt loam. In some areas, the depth to lime is more than 25 inches.

Included in mapping are small areas of Crofton soils on more exposed and convex slopes. Also included are small areas of Burchard, Pawnee, and Steinauer soils on lower slopes. The included soils make up about 3 to 9 percent of the map unit.

Permeability is moderate. The available water capacity is high. Runoff is rapid. The content of organic matter is moderately low, and natural fertility is medium. This soil is easily tilled within a moderately wide range of moisture content. The shrink-swell potential is moderate.

Most of the acreage is cultivated. The rest is used as range or pasture.

Under dryland management, this soil is suited to corn, soybeans, small grains, dryland grasses, and alfalfa. If this soil is used for cultivated crops, erosion is a hazard. Stubble mulching and other conservation practices help to reduce sheet erosion and the formation of rills and gullies. Smooth slopes can be terraced and farmed on the contour. Returning crop residue to the soil and adding organic matter help to improve fertility and to reduce erosion.

This soil is suited to use as pasture. A grass cover is effective in controlling erosion. Overgrazing or grazing when the soil is wet results in surface compaction, excessive runoff, and poor tilth, leading to rill and gully erosion.

This soil is suited to use as range. Proper grazing use and range seeding help to keep the grasses and soil in good condition.

This soil is suited to trees and shrubs in windbreaks. Erosion is a hazard. Competition for moisture from grasses and weeds is a concern in establishing seedlings. Planting tree rows on the contour and cover crops between the rows helps to reduce erosion. Cultivating between the tree rows and using selective herbicides help to control weeds.

This soil has good potential as habitat for openland and rangeland wildlife. The main threat to wildlife is destruction of habitat, for example, the burning of ditchbanks, fence rows, and roadsides. Preserving or improving existing habitat and establishing new habitat help considerably to increase wildlife populations.

This soil is suitable for septic tank absorption fields, but land shaping and contour installation generally are needed. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Dwellings and small commercial buildings need to be properly designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance. Damage to roads and streets by frost action can be reduced by surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is assigned to capability unit IVe-8, dryland. It is in Silty range site and in windbreak suitability group 3.

PsD2—Ponca-Crofton complex, 6 to 11 percent slopes, eroded. This complex consists of deep, strongly sloping, well drained soils on long, uneven side slopes along intermittent drainageways on the loess uplands. The side slopes are dissected by numerous small rills and gullies. The Ponca soil is on long slopes and on concave slopes in lower positions on the landscape than the Crofton soil. The Crofton soil is on the convex upper part of slopes just off ridgetops and on lower convex knobs. Most of the surface layer of these soils has been removed by erosion. Where the soils are under cultivation, the remaining surface layer is mixed with the material below it during tillage.

The soils are in areas too closely intermingled or too small to be shown separately on the map. The mapped areas are about 55 to 65 percent Ponca soil and about 25 to 35 percent Crofton soil and range from 5 to 140 acres in size.

Typically, the surface layer of the Ponca soil is grayish brown, friable silty clay about 7 inches thick. The subsoil is friable silty clay loam about 25 inches thick that is pale brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of about

60 inches is light gray and very pale brown, calcareous silt loam.

Typically, the surface layer of the Crofton soil is pale brown, friable, calcareous silt loam about 6 inches thick. The transition layer is mixed reddish yellow and light gray, very friable, calcareous silt loam about 12 inches thick. The underlying material to a depth of about 60 inches is light gray, calcareous silt loam. There are lime concretions on the surface.

Included in mapping are small areas of Burchard soils. These soils are on lower slopes. They make up about 5 to 15 percent of the map unit.

Permeability is moderate. The available water capacity is high. Runoff is rapid. The content of organic matter is moderately low in the Ponca soil and low in the Crofton soil. Natural fertility is medium in the Ponca soil and low in the Crofton soil. The water intake rate is moderate. The soils are easily tilled within a wide range of moisture content. The Ponca soil is calcareous below a depth that ranges from 14 to 24 inches. The Crofton soil is calcareous throughout.

About 75 percent of the acreage is cultivated. The rest is used as pasture or rangeland.

Under dryland management, these soils are suited to growing corn, grain sorghum, grass, and alfalfa. If these soils are used for cultivated crops, erosion is a hazard. Sheet erosion and formation of rills and gullies are common during heavy rains. Conservation practices, including grassed waterways, minimum tillage, contour farming, and terracing on smooth slopes, help to reduce soil loss. Returning crop residue to the soil and regularly adding organic matter help to improve fertility and tilth and to reduce erosion. Phosphate fertilizer is needed on the soils that are calcareous at or near the surface, because lime in the soil combines with phosphorus and makes it unavailable to crops.

Under irrigation management, these soils are poorly suited to corn, grain sorghum, and alfalfa. A sprinkler irrigation system should be used, because irrigation water is difficult to control with other methods. Close-growing crops help to reduce erosion. Practices that leave crop residue on the soil increase the content of organic matter and help to improve fertility and tilth.

These soils are suited to use as pastureland. A grass cover is effective in controlling erosion. Overgrazing results in surface compaction, excessive runoff, and poor tilth, leading to rill and gully erosion.

Using these soils as rangeland is effective in controlling wind and water erosion. Overgrazing or improper haying methods reduce the protective cover and cause the potential natural vegetation to deteriorate. Overgrazing can also result in severe soil loss by water erosion. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to maintain or improve the range condition.

These soils are suited to trees and shrubs in windbreaks. They have good potential for native trees, coniferous plants, and shrubs. Water erosion is a hazard. Competition for moisture from grasses and weeds is the main concern in establishing seedlings. Planting trees on the contour and cover crops between the tree rows helps to reduce erosion. Using selective herbicides and cultivating between tree rows help to control grasses and weeds. Seedlings and young trees need to be protected from livestock. In windbreaks that extend into areas of the Crofton soil, only those trees and shrubs that tolerate a high content of lime should be planted.

These soils have good potential for habitat for openland and rangeland wildlife. Destroying existing habitat should be avoided if possible. Establishing new habitat or improving existing habitat helps considerably to increase wildlife populations.

This soil is suitable for septic tank absorption fields, but land shaping and contour installation generally are necessary. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Dwellings and small commercial buildings need to be properly designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used to ensure better performance. Damage to roads and streets by frost action can be reduced by surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

These soils are assigned to capability unit IIIe-9, dryland, and IVe-6, irrigated. The Ponca soil is in Silty range site, and the Crofton soil is in Limy Upland range site. The Ponca soil is in windbreak suitability group 3, and the Crofton soil is in windbreak suitabilitiy group 8.

PsE2—Ponca-Crofton complex, 11 to 17 percent slopes, eroded. This complex consists of moderately steep, well drained soils on long, uneven side slopes along intermittent drainageways on the loess uplands. The side slopes are dissected by numerous small rills and gullies. The Ponca soil is on the concave lower part of long slopes below the Crofton soil. The Crofton soil is on the convex upper part of slopes just off ridgetops and on lower convex knobs. Most of the surface layer of these soils has been removed by erosion. Where the soils are under cultivation, the remaining surface layer is mixed with the material below it during tillage.

The soils are in areas too closely intermingled or too small to be shown separately on the map. The mapped areas are about 55 to 65 percent Ponca soil and about 30 to 35 percent Crofton soil and range from 5 to 130 acres in size.

Typically, the surface layer of the Ponca soil is dark gray, friable silty clay loam about 5 inches thick. The subsoil is light brownish gray, friable silty clay loam about

8 inches thick. The upper part of the underlying material is light brownish gray, friable, calcareous silt loam about 7 inches thick. The lower part to a depth of about 60 inches is light gray, calcareous silt loam.

Typically, the surface layer of the Crofton soil is light gray, friable, calcareous silt loam about 6 inches thick. The upper part of the underlying material is light gray, calcareous silt loam. The middle part is pale yellow, calcareous silt loam. The lower part to a depth of 60 inches is light gray, calcareous silt loam. There are strong brown relict mottles throughout.

Included in mapping and making up about 5 to 15 percent of the mapped areas are small areas of Burchard soils on the lower part of slopes.

Permeability is moderate. The available water capacity is high. Runoff is rapid. The content of organic matter is moderately low in the Ponca soil and low in the Crofton soil. Natural fertility is medium in the Ponca soil and low in the Crofton soil. The soils are easily tilled within a wide range of moisture content. The Ponca soil is calcareous below a depth of 14 to 24 inches. The Crofton soil is calcareous throughout.

About 65 percent of the acreage is cultivated. The rest is used as pasture.

Under dryland management, these soils are poorly suited to cultivated crops and to grasses and alfalfa. If these soils are used for cultivated crops, they are subject to sheet erosion and gullies are likely to form. Grassed waterways, minimum tillage, contour farming (fig. 13), terracing on smooth slopes, and other conservation practices help to prevent soil loss. Returning crop residue to the soil and regularly adding organic matter improve fertility and tilth and help to reduce erosion. Phosphate fertilizer is needed on the soils that are calcareous at or near the surface because lime in the soil combines with phosphorus and makes it unavailable to crops.

These soils are suited to use as pasture. A grass cover is effective in controlling erosion. Overgrazing results in surface compaction and increased runoff, which leads to rill and gully erosion. Proper stocking and rotation grazing help to maintain the grasses and the soil in good condition.

These soils are suited to trees and shrubs in windbreaks. They have good potential for native trees, conifers, and shrubs. Water erosion is a hazard. Competition for moisture from undesirable grasses and

Figure 13.—Contour farming helps conserve water and control erosion in an area of Ponca-Crofton complex, 11 to 17 percent slopes, eroded. The soils have good potential for use as habitat for wildlife.

weeds is the main concern in establishing seedlings. Planting trees on the contour and a cover crop between the tree rows helps to reduce erosion. Using selective herbicides and cultivating between tree rows help to control grasses and weeds. Seedlings and young trees need to be protected from livestock. In windbreaks that extend into areas of the Crofton soil, only trees and shrubs that tolerate a high content of lime should be planted.

These soils have good potential as habitat for rangeland and openland wildlife. Destroying existing habitat should be avoided if possible. Establishing new habitat or improving existing habitat helps considerably to increase wildlife populations.

This soil is suitable for septic tank absorption fields, but land shaping and contour installation generally are needed. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. Lagoons need to be lined or sealed to prevent seepage. Dwellings and small commercial buildings need to be properly designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser soil material can be used for subgrade or base material to ensure better performance. Damage to roads and streets by frost action can be reduced by surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

These soils are assigned to capability unit IVe-9, dryland. The Ponca soil is in Silty range site, and the Crofton soil is in Limy Upland range site. The Ponca soil is in windbreak suitability group 3, and the Crofton soil is in windbreak suitability group 8.

PsF2—Ponca-Crofton complex, 17 to 30 percent slopes, eroded. This complex consists of steep, somewhat excessively drained soils on long, uneven side slopes along intermittent drainageways on the loess uplands. The side slopes are dissected by numerous small rills and gullies. The Ponca soil is on longer slopes and on the concave lower part of slopes below the Crofton soil. The Crofton soil is on the convex upper part of slopes just off the ridgetops. Most of the surface layer of these soils has been eroded away. Where the soils are under cultivation, the remaining surface layer is mixed with the subsoil during tillage.

The soils are in areas too closely intermingled or too small to be shown separately on the map. The mapped areas are about 55 to 65 percent Ponca soil and 30 to 35 percent Crofton soil and range from 5 to 130 acres in size.

Typically, the surface layer of the Ponca soil is grayish brown, friable silty clay loam about 6 inches thick. The subsoil is pale brown, friable silty clay loam about 16 inches thick. The underlying material to a depth of about 60 inches is light gray, calcareous silt loam.

Typically, the surface layer of the Crofton soil is grayish brown, friable, calcareous silt loam about 8 inches thick. The upper part of the underlying material is light brownish gray, calcareous silt loam. The lower part to a depth of 60 inches is light gray, calcareous silt loam. There are calcium concretions and yellowish red relict mottles throughout the underlying material.

Included in mapping are small areas of Burchard soils on the lower part of slopes. These soils make up about 5 to 10 percent of the map unit.

Permeability is moderate. The available water capacity is high, and runoff is rapid. The content of organic matter is moderately low in the Ponca soil and low in the Crofton soil. Natural fertility is medium in the Ponca soil and low in the Crofton soil. Because of the high content of lime in the surface layer, the Crofton soil generally is low in available phosphorus. These soils have good tilth within a moderately wide range of moisture content. The shrink-swell potential is moderate in the Ponca soil and low in the Crofton soil.

Most of the acreage is in native grasses or is used as pasture. In a few small areas, the soils are in trees.

These soils are not suited to cultivated crops because of the steep slopes and the very severe hazard of water erosion.

These soils are suited to use as pasture. Pasture generally is bromegrass or a mixture of bromegrass and alfalfa or orchardgrass and alfalfa. Overgrazing or improper haying methods reduce the protective cover and cause the plant population to deteriorate. A grass cover is highly effective in controlling erosion. Proper stocking, rotation grazing, and nitrogen fertilizer help to maintain maximum yields and keep the grasses in good condition. Timely mowing reduces weed competition.

These soils are suited to use as range. Proper grazing use, deferred grazing, and a planned grazing system are management practices that help to maintain the native plant community and keep the soil in good condition.

These soils generally are too steep for mechanical planting or care of windbreaks to be practical. Erosion is a very severe problem. Onsite evaluation is needed to determine if the soils in some areas can be planted to trees and shrubs by hand.

These soils are suited to use as habitat for rangeland and woodland wildlife. A wide variety of plants that provide food and cover for wildlife grow on this soil.

These soils generally are not suited to sanitary facilities because of the steep slopes. A substitute site is needed. Dwellings need to be designed to accommodate the slope, or extensive grading is needed to modify the slope. Extensive cuts and fills are needed to provide a suitable grade for roads. Roads need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Damage to roads and streets by frost action on the Ponca soil can be reduced by surface drainage. Crowning the road by

grading and constructing adequate side ditches help to provide the needed surface drainage.

These soils are assigned to capability unit VIe-9, dryland. The Ponca soil is in Silty range site, and the Crofton soil is in Limy Upland range site. Both soils are in windbreak suitability group 10.

Sa—Saltine-Gibbon silt loams, 0 to 1 percent slopes. These are deep, nearly level, somewhat poorly drained soils that are occasionally flooded. They are on bottom lands of the Platte River. The Saltine soil contains saline and alkali salts above a depth of 20 inches.

These soils are in areas too closely intermingled to be mapped separately. The mapped areas are about 45 to 60 percent Saltine soil and 35 to 45 percent Gibbon soil. They are irregular in shape and range from 10 to 250 acres in size.

Typically, the upper part of the surface layer of the Saltine soil is dark gray, friable, calcareous silt loam about 7 inches thick. The lower part is gray, friable, calcareous silt loam about 2 inches thick. The subsoil is grayish brown, friable, calcareous silty clay loam that has brown mottles. It is about 16 inches thick. The underlying material to a depth of about 60 inches is light gray, calcareous silty clay loam that has a few salt clusters and brown mottles.

Typically, the upper part of the surface layer of the Gibbon soil is very dark brown, very friable silt loam about 6 inches thick. The middle part of the surface layer is very dark brown silt loam, and the lower part, which extends to a depth of 15 inches, is very dark grayish brown silty clay loam. The transition layer is grayish brown, mottled silt loam about 12 inches thick. The underlying material is grayish brown loam and silty clay loam to a depth of 52 inches. Below that, it is very dark grayish brown silt loam.

Included in mapping are areas of Lamo soils in slightly lower positions on the landscape and areas of Muir soils in higher positions. The included soils make up about 5 to 10 percent of the map unit.

Permeability is moderately slow in the Saltine soil and moderate in the Gibbon soil. The available water capacity is high. Runoff is slow. The seasonal high water table is at a depth of 2 to 3 feet. It is highest in winter and spring. The content of organic matter is moderate in the Gibbon soil and moderately low or low in the Saltine soil. Natural fertility is low in the Saltine soil and high in Gibbon soil. The water intake rate is moderate. The Gibbon soil is moderately alkaline except in the lower part of the underlying material, which is strongly alkaline. The Saltine soil is strongly alkaline.

Most of the acreage of these soils is used for cultivated crops. In some places, the soils are used as pasture or as range.

Under dryland management, these soils are suited to wheat, soybeans, and grain sorghum. The soils are poorly suited to corn. The main problems are poor drainage and the slight amounts of soluble salts and exchangeable sodium, which can cause poor tilth and restricted movement of water, air, and roots in the soil. In dry periods, crops on these soils exhibit damage caused by salinity. In areas where salts have accumulated, seed germination is poor, plants are stunted, and grain is of poor quality. Adequate drainage and chemical amendments can improve saline-alkali conditions.

Under irrigation, these soils are poorly suited to corn, grain sorghum, wheat, and soybeans because of the saline-alkali conditions. The same practices that are used in dryland management are also used in irrigation management.

These soils are suited to use as pasture or as rangeland. Grasses that tolerate wetness and saline-alkali conditions provide a dependable source of forage in summer. Overgrazing causes the plant community to deteriorate. Proper stocking, rotation grazing, weed control, use of fertilizer, and water management help to keep the pasture grasses in good condition and improve fertility. The distribution of livestock on rangeland can be improved by correctly locating fences and watering places. Grazing on these soils when they are wet can cause the surface layer to become compacted and bogs or small mounds to form. Grazing and hay harvesting then become difficult. Restricted grazing in wet periods helps to maintain the plants in good condition.

These soils are poorly suited to trees and shrubs in windbreaks. Wetness, abundant and persistent weeds, and saline-alkali conditions are the main problems to consider in establishing windbreaks. Weeds can be controlled by cultivating between the tree rows with conventional equipment, by hand hoeing or rototilling around trees, and by appropriate herbicides. Drainage systems can reduce wetness. Only those trees and shrubs that tolerate wetness and saline-alkali conditions should be planted.

These soils are not suited to septic tank absorption fields because of flooding, the seasonal high water table, and the moderately slow permeability of the Saltine soil. Sewage lagoons need to be constructed on fill material to raise the bottom of the lagoon well above the seasonal high water table. Lagoons need to be diked as protection against flooding. On the Gibbon soil, sewage lagoons need to be lined or sealed to prevent seepage. The soils are not suited to use as building sites because of flooding. Constructing roads on suitable and well compacted fill material above flood level and providing adequate side ditches and culverts help to protect the roads from flood damage and wetness. On the Gibbon soil, roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Damage to roads by frost action can be reduced by surface drainage and a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

These soils are assigned to capability units IIIs-1, dryland, and IIIs-3, irrigated. The Saltine soil is in Saline

Subirrigated range site, and the Gibbon soil is in Subirrigated range site. The Saltine soil is in windbreak suitability group 9S, and the Gibbon soil is in windbreak suitability group 2S.

Sc—Scott silt loam, 0 to 1 percent slopes. This is a deep, nearly level, very poorly drained soil in large depressions on upland loess plains. This soil is frequently ponded. Areas are nearly round or oblong in shape and range from 10 to 120 acres in size.

Typically, the surface layer is gray, friable silt loam about 6 inches thick. The subsurface layer is light gray, very friable silt loam about 4 inches thick. The subsoil is 39 inches thick. The upper part is dark gray, very firm silty clay; the middle part is gray, very firm silty clay; and the lower part is light gray, firm silty clay loam. The underlying material to a depth of 60 inches is light brownish gray, mottled silt loam.

Included in mapping are small areas of Fillmore soils along the edge of the depressions. The included soils make up about 5 to 15 percent of the mapped areas.

Permeability is very slow. The available water capacity is high. Natural fertility is medium, and the content of organic matter is moderate. Reaction is slightly acid in the surface and subsurface layers and neutral in and below the subsoil. This soil is frequently ponded by runoff from adjacent areas. The perched seasonal high water table fluctuates from 6 inches above the surface to 1 foot below the surface. Because the claypan subsoil does not allow much water to penetrate, excess water is removed mainly by evaporation. This soil is easily tilled.

The way in which this soil is used varies widely, depending on moisture conditions. In abnormally dry periods, the soil is cultivated and crops are raised. In wet years, crops are drowned out and the ground is left idle. This soil is very poorly suited to corn or soybeans. In years of abnormally low rainfall, wheat and grain sorghum can be grown with moderate success. In areas where large dugouts or pits, tile drains, and deep ditches have been installed to improve drainage, cultivated crops can be grown with moderate success.

This soil is poorly suited to use as pasture. Annual weeds and aquatic plants are the most common vegetation. In areas where the soil is not ponded too deeply or for too long, native grasses provide some pasture. Grazing should be deferred when the soil is wet in order to keep the soil from becoming compacted and to maintain the health of the plant community.

This soil is not suited to trees and shrubs in windbreaks, because it is too frequently ponded for extended periods.

This soil provides suitable habitat for wetland wildlife during part of the year. In some years, the soil is ponded long enough in some places to provide nesting sites for waterfowl.

This soil is not suited to septic tank absorption fields because of ponding and slow permeability. It is not suited to sewage lagoons because of ponding. It is not suited to use as building sites because of ponding and the high shrink-swell potential in the subsoil. This soil is poorly suited to roads and streets because of ponding, low strength, and frost action. The road base needs to be designed to strengthen the subgrade. Drainage outlets are needed to remove excess water. If possible, a substitute site should be selected.

This soil is assigned to capability unit IVw-2, dryland. It is in windbreak suitability group 10.

Sh—Sharpsburg silty clay loam, 0 to 2 percent slopes. This is a nearly level, moderately well drained soil on broad divides of the loess uplands. Areas are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is dark gray, friable silty clay loam about 12 inches thick. The subsoil is about 34 inches thick. The upper part of the subsoil is dark grayish brown, friable silty clay loam; the middle part is pale brown, firm, heavy silty clay loam; and the lower part is light yellowish brown, firm silty clay loam. The underlying material to a depth of 60 inches is very pale brown silt loam.

Permeability is moderately slow. The available water capacity is high. Runoff is slow. The water intake rate is low. Reaction is slightly acid in the upper part and neutral throughout the rest of the profile. Natural fertility is high, and the content of organic matter is moderate. Tilth generally is good. This soil is easily tilled within a fairly wide range of moisture content.

Nearly all of the acreage is used for cultivated crops.

Under dryland management, this soil is suited to corn, soybeans, grain sorghum, wheat, and alfalfa. Because this soil is nearly level, it tends to stay wet longer after rainfall. In some low spots, this wetness delays cultivation. Conservation practices that leave crop residue on or near the surface of the soil, for example, minimum tillage, help to maintain or improve fertility and tilth and to increase the content of organic matter.

Under irrigation, this soil is suited to row crops, for example, corn, soybeans, and grain sorghum, and to close-grown crops, for example, alfalfa, tame grasses for pasture, and small grains. Furrow and sprinkler irrigation systems are well suited. Land leveling and installing an irrigation tailwater recovery system increase the efficiency of water use under furrow irrigation. The rate at which water is applied needs to be adjusted so that it does not exceed the low intake rate.

This soil is suited to use as pasture, but it is little used for this purpose because of its value as cropland. The main concern in management is prevention of overgrazing.

The vegetation on this soil provides food for openland wildlife, but very little cover is available. Turnrows can be left in grass to provide additional cover.

This soil is suited to trees in farmstead windbreaks. The main concern in management is keeping the windbreak clear of weeds and undesirable grasses to reduce competition for moisture. Cultivating between tree

rows helps to control weeds, and preemergence herbicides can be used for several years after planting.

The moderately slow permeability is a limitation for septic tank absorption fields, but this limitation generally can be overcome by increasing the size of the absorption field. Sewage lagoons need to be lined or sealed to prevent seepage. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Damage to roads and streets by frost action can be reduced by surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to prevent shrinking and swelling.

This soil is assigned to capability units I-1, dryland, and I-3, irrigated. It is in Silty range site and windbreak suitability group 3.

ShC—Sharpsburg silty clay loam, 2 to 6 percent slopes. This is a deep, gently sloping, moderately well drained soil along intermittent drainageways on concave side slopes and ridgetops of the loess uplands. Areas generally are long and narrow, but some areas on the top of ridges are large and irregular in shape. Areas are 15 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam in the upper part and dark brown, friable silty clay loam in the lower part, which extends to a depth of about 12 inches. The subsoil is friable silty clay loam about 41 inches thick. The upper part is brown, and the lower part is pale brown. The underlying material to a depth of 60 inches is very pale brown silt loam.

Permeability is moderately slow. The available water capacity is high. Runoff is rapid. The water intake rate is low. Reaction is slightly acid in the surface layer and neutral below it. Natural fertility is high. The content of organic matter is moderate. The surface layer is easily tilled within a fairly wide range of moisture content.

Almost all of this soil is used for cultivated crops. In a few very small areas, it is used as pasture.

Under dryland management, this soil is suited to corn, grain sorghum, oats, wheat, and alfalfa. The hazard of erosion is moderate. Contour farming, minimum tillage, terracing on smooth slopes, grassed waterways, and other conservation practices help to control erosion. Returning organic matter to the soil helps to maintain or improve tilth and fertility.

This soil is suited to irrigation. Sprinkler irrigation is most suitable because of the difficulty in controlling irrigation water with other methods. Conservation practices that return crop residue to the soil build up the content of organic matter and thereby improve the intake rate and help to maintain fertility. Under proper irrigation management, corn, grain sorghum, alfalfa, and pasture grasses can be grown with good success.

This soil is suited to use as range and pasture, but it is seldom used for these purposes because of its value for corn and other crops.

This soil is suited to trees and shrubs in windbreaks. The hazard of erosion is moderate. Planting trees on the contour and a cover crop between the tree rows helps to control erosion. Competition from weeds and grasses is a major hindrance to seedling establishment. Cultivating between the tree rows and using selective herbicides help to control weeds that can choke out seedlings. Seedlings and young trees need to be protected from livestock.

The moderately slow permeability of this soil is a limitation for septic tank absorption fields, but this limitation generally can be overcome by increasing the size of the absorption field. For sewage lagoons, grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Damage to roads and streets by frost action can be reduced by surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to prevent shrinking and swelling.

This soil is assigned to capability units IIe-1, dryland, and IIIe-3, irrigated. It is in Silty range site and in windbreak suitability group 3.

ShC2—Sharpsburg silty clay loam, 2 to 6 percent slopes, eroded. This is a gently sloping, moderately well drained soil along intermittent drainageways on convex ridgetops and upper side slopes of the loess uplands. Part of the surface layer has been removed by sheet and rill erosion. The remaining surface layer is mixed with the subsoil during tillage. Areas generally are longer than they are wide and range from 5 acres to about 30 acres in size.

Typically, the surface layer is very dark gray, friable silty clay loam about 7 inches thick. The subsoil is about 29 inches thick. The upper part is dark brown, friable silty clay loam; the middle part is dark yellowish brown, friable silty clay loam, and the lower part is yellowish brown, friable silty clay loam. The underlying material to a depth of 60 inches is very pale brown silt loam in the upper part and mixed brownish yellow and light gray silt loam in the lower part. Erosion has not been uniform, and in places the surface layer is as thick as that of the uneroded soil.

Permeability is moderately slow. The available water capacity is high. Runoff is rapid. The water intake rate is

low. Reaction is slightly acid in the surface layer and neutral below that. Natural fertility is medium. The content of organic matter is moderately low. The surface layer is easily tilled within a fairly wide range of moisture content.

Most of the acreage is cultivated. In some areas, the soil is irrigated.

Under dryland management, this soil is suited to corn, grain sorghum, oats, wheat, and alfalfa. Erosion is a hazard. Conservation practices, for example, contour farming, minimum tillage, terracing on smooth slopes, and grassed waterways, help to prevent erosion. Returning organic matter to the soil helps to improve tilth and fertility and to prevent the formation of rills and gullies.

If this soil is irrigated, a sprinkler irrigation system is most suitable because of the difficulty in controlling irrigation water with other methods. Adding organic matter to this soil helps to improve the low intake rate. Under proper irrigation management, corn, grain sorghum, and alfalfa can be grown with good success.

This soil is suited to use as pasture. Using this soil as pasture is effective in controlling erosion. Overgrazing reduces the protective plant cover and causes the grasses to deteriorate. This soil is suited to use as rangeland, but it is seldom used for that purpose.

This soil is suited to trees in windbreaks. Drought and competition for moisture from weeds and grasses are the main concerns in estabishing tree seedlings. Competition from weeds and grasses can be eliminated by mechanical cultivation between the tree rows and by hand hoeing or using selective herbicides in the rows. Planting trees on the contour helps to reduce erosion.

The vegetation that grows on these soils provides food for openland wildlife, but very little cover is available. Turnrows can be left in grass to provide added cover.

The moderately slow permeability is a limitation for septic tank absorption fields. This limitation generally can be overcome by increasing the size of the absorption field. For sewage lagoons, grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Damage to roads and streets by frost action can be reduced by surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to prevent the shrinking and swelling.

This soil is assigned to capability units IIIe-8, dryland, and IIIe-3, irrigated. It is in Silty range site and in windbreak suitability group 3.

ShD—Sharpsburg silty clay loam, 6 to 11 percent slopes. This is a deep, strongly sloping, moderately well drained soil along intermittent drainageways on convex and concave side slopes of uplands. Areas are long and narrow and are dissected by shallow drainageways. The areas generally range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam in the upper part and grayish brown, friable silty clay loam in the lower part. The surface layer is about 14 inches thick. The subsoil in the upper part is brown, friable silty clay loam. The middle part of the subsoil is yellowish brown, friable silty clay loam, and the lower part to a depth of 60 inches is light yellowish brown, friable silty clay loam.

Included in mapping are small areas of Judson soils that adjoin the drains. These soils make up about 5 to 15 percent of this map unit.

Permeability is moderately slow. Runoff is rapid. The available water capacity is high. The water intake rate is low. The content of organic matter is moderate, and natural fertility is high. Tilth is generally good. This soil can be tilled within a fairly wide range of moisture content.

Most of the acreage is in grasses that are used for hay or pasture. Most pastures are near farmsteads. In some small areas, the soil is cultivated.

Under dryland management, this soil is suited to corn, grain sorghum, wheat, and alfalfa. If this soil is cultivated, water erosion is the main hazard. Grassed waterways and conservation practices that include minimum tillage help to prevent erosion. Smooth slopes can be terraced and farmed on the contour. Returning crop residue to the soil and regularly adding organic matter help to improve tilth and to reduce erosion.

If this soil is irrigated, the control of water becomes a problem. Sprinkler irrigation is the most practical method on this soil because of the slope. Close-growing crops and terraces help to control erosion. Conservation practices that leave crop residue on the surface add organic matter to the soil and help to improve fertility.

This soil is suited to use as pasture. Properly managed grassland or grass and legume pasture is effective in preventing erosion. Overgrazing, grazing under extremely wet conditions, and a poor grazing rotation result in compaction, poor tilth, excessive runoff, and erosion. Gullies and rills can form as a result of erosion.

This soil is suited to trees and shrubs in windbreaks. It has good potential for native trees, coniferous plants, and shrubs. Water erosion is a hazard. Competition for moisture from grasses and weeds is the main hindrance to establishing seedlings. Planting trees on the contour and planting a cover crop between the tree rows help to reduce erosion. Selective herbicides and cultivation between the tree rows help to control grasses and weeds. Seedlings and young trees need to be protected from livestock.

The moderately slow permeability is a limitation for septic tank absorption fields. This limitation generally can

be overcome by increasing the size of the absorption field. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Houses and small commercial buildings need to be properly designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Foundations for buildings need to be strengthened and backfilled with coarser soil material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser material can be used for subgrade or base material to ensure better performance. Damage to roads and streets by frost action can be reduced by surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to prevent shrinking and swelling.

This soil is assigned to capability units IIIe-1, dryland, and IVe-3, irrigated. It is in Silty range site and in windbreak suitability group 3.

ShD2—Sharpsburg silty clay loam, 6 to 11 percent slopes, eroded. This is a deep, strongly sloping, moderately well drained soil along intermittent drainageways on side slopes of the loess uplands. Slopes are convex on the upper part and concave on the lower part. Most of the areas are dissected by rills or shallow drainageways. Erosion has removed most of the surface layer. The remaining surface layer is mixed with the subsoil during tillage. Areas are long and narrow and range from 10 to 40 acres in size.

Typically, the surface layer is grayish brown, friable silty clay loam about 7 inches thick. Its thickness varies according to tillage depth. The subsoil is friable silty clay loam about 21 inches thick. It is light brownish gray in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is very pale brown silt loam.

Included in mapping are small areas of Judson soils that adjoin the drains. These soils make up about 5 to 15 percent of this map unit.

Permeability is moderately slow. Runoff is rapid. The available water capacity is high. The water intake rate is low. The content of organic matter is moderately low, and natural fertility is medium. Tilth is generally good. This soil can be tilled within a fairly wide range of moisture content.

Most of the acreage is used for cultivated crops. The rest is used as pasture and rangeland.

Under dryland management, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is the main hazard. Small rills and gullies form rapidly during heavy rains. Grassed waterways and conservation practices, for example, minimum tillage, help to prevent soil loss. Smooth slopes can be terraced and farmed on the contour. Returning crop residue to the soil and regularly adding organic matter help to improve fertility and tilth and to reduce erosion.

If this soil is irrigated, a sprinkler irrigation system is most suitable, because the slope makes it difficult to control irrigation water with other systems. This soil is better suited to close-growing crops than to row crops because erosion and irrigation water are more difficult to control on row crops. Returning crop residue to the soil and adding organic matter help to reduce erosion, to maintain or improve tilth and fertility, and to increase permeability.

This soil is suited to use as pasture. Tame pasture is generally bromegrass or a mixture of bromegrass and alfalfa or orchardgrass and alfalfa. Overgrazing or improper haying methods reduce the protective cover and cause the plant population to deteriorate. A grass cover is highly effective in controlling erosion. Proper stocking, rotation grazing, and nitrogen fertilizer help to maintain maximum yields and to keep the grasses in good condition. Timely mowing reduces weed competition.

This soil is suited to use as range. Proper grazing use, deferred grazing, and range seeding are management practices that help to keep the soil and plants in good condition.

This soil is suited to trees and shrubs in windbreaks. It has good potential for native trees, coniferous plants, and shrubs. Water erosion is a hazard. Competition for moisture from grasses and weeds is the main concern in establishing seedlings. Planting trees on the contour and a cover crop between the tree rows helps to lessen erosion. Selective herbicides and cultivation between the tree rows help to control grasses and weeds. Seedlings and young trees need to be protected from livestock.

The moderately slow permeability is a limitation for septic tank absorption fields. This limitation generally can be overcome by increasing the size of the absorption field. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Houses and small commercial buildings need to be properly designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser material can be used for subgrade or base material to ensure better performance. Damage to roads and streets by frost action can be reduced by surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to prevent shrinking and swelling.

This soil is in capability units IIIe-8, dryland, and IVe-3, irrigated. It is in Silty range site and windbreak suitability group 3.

Sk—Silver Creek complex, 0 to 2 percent slopes. This complex consists of deep, nearly level, somewhat poorly drained soils that contain appreciable amounts of salt. The soils are on bottom lands and low terraces of the Platte River but are rarely flooded. Silver Creek soils are moderately to strongly affected by salinity and alkali. The Silver Creek soil that is moderately affected by saline-alkali conditions makes up about 75 percent of the mapped areas, and the soil that is strongly affected makes up about 15 percent. These soils are in areas that are too closely intermingled on the landscape to be mapped separately. The mapped areas range from 10 to 60 acres in size.

Typically, the soil that is moderately affected by saline-alkali conditions has a surface layer of very dark gray, calcareous, firm silt loam about 6 inches thick. The subsurface layer is very dark gray clay loam about 9 inches thick. The subsoil is dark gray, calcareous, firm silty clay about 8 inches thick. The underlying material to a depth of about 60 inches is grayish brown and olive gray, calcareous sandy clay loam in the upper part and olive gray loamy sand in the lower part. In some areas, the content of salts is lower than is typical.

The soil that is strongly affected by saline-alkali conditions differs from the moderately affected soil in that it has a thinner surface layer, a thin transition layer, and a denser subsoil.

Included in mapping are small areas of Lamo and Zook soils and some slick spots. The included soils make up about 10 percent of the mapped areas.

Permeability is slow. Runoff is slow. The available water capacity is moderate. The content of organic matter is moderately low, and natural fertility is low. The shrink-swell potential is high, and cracks form as these soils dry out. The seasonal high water table ranges from a depth of 2 to 4 feet. Tilth of these soils is poor because of the saline-alkali conditions.

About half of the acreage is cultivated. The rest is used as pasture or hayland.

Under dryland management, these soils are not suited to corn and are poorly suited to wheat, soybeans, and grain sorghum. The main problems are poor drainage and the soluble salts and exchangeable sodium, which can cause poor tilth and restrict the movement of water, air, and roots in the soil. In dry periods, crops on these soils exhibit damage caused by salinity. In places where salts have accumulated, seed germination is poor, plants are stunted, and grain is of poor quality. Adequate drainage and chemical amendments can reduce the salinity and alkalinity. These soils generally are not suited to irrigation.

These soils are suited to use as pasture or range. Grasses that tolerate wetness and saline-alkali conditions provide a dependable source of forage in summer. Overgrazing causes the plant community to deteriorate. Proper stocking, a planned grazing system, weed control, and fertilizer help to keep the pasture grasses in good condition and improve fertility. The distribution of livestock on rangeland can be improved by correctly locating fences, watering places, and salting facilities. Grazing when these soils are wet can cause the surface layer to become compacted and bogs or small mounds to form. Grazing and hay harvesting then become difficult. Restricted grazing in wet periods helps to maintain the plant community in good condition.

These soils are poorly suited to trees and shrubs in windbreaks. Wetness, abundant and persistent weeds, saline-alkali conditions, and soil cracking caused by the shrinking and swelling of the soil are the main problems. Providing drainage helps to overcome wetness. Weeds can be controlled by cultivating between tree rows with conventional equipment, by hand hoeing or rototilling around trees, and by using appropriate herbicides. Only those trees and shrubs that are adapted to wetness and saline-alkali conditions should be planted. Light cultivation helps to control soil cracking.

These soils are not suited to septic tank absorption fields because of slow permeability. Sewage lagoons need to be constructed on fill material to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. Sewage lagoons need to be diked as protection from flooding and to be lined or sealed to prevent seepage. Dwellings and buildings need to be constructed on raised and well compacted fill material because of the wetness caused by the water table and as protection against flooding. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Damage to roads by frost action can be reduced by surface drainage and a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to prevent shrinking and swelling.

These soils are assigned to capability unit IVs-1, dryland. They are in Saline Subirrigated range site and in windbreak suitability group 9S.

SmB—Simeon loamy sand, 0 to 3 percent slopes. This is a deep, nearly level and very gently sloping, excessively drained soil on wide terraces along the Platte River. The areas are large and irregular in shape and generally are several hundred acres in size.

Typically, the upper part of the surface layer is dark gray, very friable loamy sand about 8 inches thick. The lower part is dark grayish brown, very friable loamy sand about 5 inches thick. The transition layer is brown, loose loamy coarse sand about 7 inches thick. The upper part

of the underlying material is pale brown coarse sand about 20 inches thick. The lower part to a depth of about 60 inches is light gray coarse sand.

Included in mapping are small areas of Brocksburg and Thurman soils. These soils make up about 10 percent of the map unit.

Permeability is rapid. The available water capacity is low. Runoff is very slow. The intake rate for irrigation water is high. Natural fertility and the content of organic matter are low. Plant nutrients are easily leached from this soil. Tilth is fair.

Most of the acreage is used for irrigated crops. Some is rangeland and is in short native grasses.

This soil is not suited to dryfarming because of droughtiness and because soil blowing is a very severe hazard.

This soil is poorly suited to cultivated crops under gravity irrigation. A high degree of management is needed. Because of the high water intake rate and the gently undulating topography, sprinkler irrigation is most satisfactory (fig. 14). A sprinkler irrigation system distributes water more evenly than is possible with other systems, and it allows light, frequent applications of water. Soil blowing is the main hazard, and droughtiness and low fertility are major concerns. Stubble mulching, minimum tillage, and other conservation practices help to control soil blowing. Cover crops, crop residue left on the surface, and prevention of overgrazing of crop stubble are important in controlling soil blowing and also help to conserve soil moisture. Timely irrigation helps to prevent soil blowing and to overcome droughtiness. Applications of commercial fertilizer and organic matter are needed to maintain yields at an acceptable level. Because the soil is rapidly permeable and excessively drained, plant nutrients are quickly leached from it; therefore, fertilizer needs to be applied frequently and in small amounts by adding it to the irrigation water.

Using this soil as rangeland is effective in controlling wind erosion. Because this soil is sandy and droughty, the native grasses are sparse and unproductive. Overgrazing reduces the protective cover and causes the plant community to deteriorate. The distribution of livestock on rangeland can be improved by correctly locating fences, watering places, and salting facilities.

This soil is not suited to trees and shrubs in windbreaks.

Figure 14.—Irrigated corn on Simeon loamy sand, 0 to 3 percent slopes, on Platte River bottom land.

This soil is suited to septic tank absorption fields, but because the soil is rapidly permeable, contamination of the ground water is a hazard. This soil is poorly suited to sewage lagoons because seepage may contaminate the ground water. Sewage lagoons need to be lined with less permeable soil material, or impervious liners can be installed. This soil is suited to use as building sites and to local roads and streets. The sides of shallow excavations can be shored to prevent sloughing or caving. Areas where the soil has been disturbed need to be replanted as soon as possible to prevent soil blowing.

This soil is assigned to capability units VIs-4, dryland, and IVs-14, irrigated. It is in Sands range site and in windbreak suitability group 10.

StD2—Steinauer clay loam, 6 to 11 percent slopes, eroded. This is a deep, strongly sloping, well drained soil on side slopes along intermittent drainageways of uplands. Most of the surface layer has been removed by sheet and rill erosion. The remaining surface layer is mixed with the subsoil during tillage. Small rills and gullies form easily during heavy rains. Most areas are dissected by shallow drainageways. Rocks and pebbles are common on the surface. Areas generally are long and narrow and range from 15 acres to about 90 acres in size.

Typically, the surface layer is pale brown, calcareous, friable clay loam about 7 inches thick. The transition layer is pale brown, friable, calcareous clay loam about 9 inches thick. The underlying material to a depth of about 60 inches is light gray, calcareous clay loam.

Included in mapping are small areas of Burchard soils on the lower part of side slopes and along drainageways. These included soils make up about 10 percent of the map unit.

Permeability is moderately slow. The available water capacity is high. Runoff is rapid. Natural fertility is low, and the content of organic matter is low. Reaction is mildly alkaline in the surface layer and moderately alkaline below that. The phosphorus content is low. Tilth is poor because of the high content of clay and the stony surface.

Most of the acreage is under cultivation. In some areas, the soil is used as pasture or rangeland.

Under dryland management, this soil is poorly suited to corn, grain sorghum, small grains, and alfalfa. If this soil is used for cultivated crops, water erosion is a hazard. Sheet erosion is common, and rills and gullies form rapidly on this soil during rains. Conservation practices, including minimum tillage, contour farming, and terracing on smooth slopes, help to prevent soil loss. Returning crop residue to the soil and making regular additions of organic matter help to improve fertility and tilth and to reduce erosion. Phosphate fertilizer is needed because the lime in this soil combines with natural phosphorus and makes it unavailable to crops.

This soil is suited to use as pasture. Pasture generally is bromegrass or a mixture of bromegrass and alfalfa or orchardgrass and alfalfa. Overgrazing or improper haying methods reduce the protective cover and cause the plant population to deteriorate. A grass cover is highly effective in controlling erosion. Proper stocking, rotation grazing, and nitrogen fertilizer help to maintain maximum yields and keep the grasses in good condition. Timely mowing reduces weed competition.

Using this soil as rangeland is effective in controlling wind and water erosion. Overgrazing reduces the protective cover and causes the potential natural vegetation to deteriorate. It also can result in severe gully erosion and create major blowouts. Proper grazing use, timely deferment of grazing, and a planned grazing system help to maintain or improve the range condition.

This soil is suited to trees and shrubs in windbreaks. It has good potential for native trees, conifers, and shrubs. Water erosion is a hazard. Competition for moisture from grasses and weeds is the main concern in establishing tree seedlings. Planting trees on the contour and cover crops between the tree rows helps reduce erosion. Using selective herbicides and cultivating between the trees help to control grasses and weeds that can choke out seedlings. Seedlings and young trees need to be protected from livestock. Only those trees that tolerate a high calcium content should be planted.

This soil has good potential for habitat for openland and rangeland wildlife. The main threat to wildlife is the destruction of habitat. Protecting waste areas, preserving and improving other existing habitat, and establishing new habitat help considerably to increase wildlife populations.

Septic tank absorption fields need to be designed to compensate for the slow permeability. Enlarging the absorption field may be necessary to prevent effluent from rising to the surface. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. Houses and small commercial buildings need to be properly designed to accommodate the slope, or the soil can be graded to modify the slope. Foundations for buildings need to be strengthened and backfilled with coarser material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser material can be used for subgrade or base material to ensure better performance. Mixing the base material for roads and streets with additives, for example, hydrated lime, helps to prevent shrinking and swelling.

This soil is assigned to capability unit IVe-9, dryland. It is in Limy Upland range site and in windbreak suitability group 8.

StF—Steinauer clay loam, 11 to 30 percent slopes. This is a deep, moderately steep and steep, somewhat excessively drained soil on side slopes along intermittent drainageways. Most areas are dissected by shallow drainageways. Small stones and pebbles are common

on the surface. Areas generally are long and narrow and range from 10 acres to about 50 acres in size.

Typically, the surface layer is dark gray, friable clay loam about 9 inches thick. The transition layer is grayish brown, friable, calcareous clay loam about 9 inches thick. The upper part of the underlying material is pale brown, calcareous clay loam about 42 inches thick. The lower part to a depth of about 60 inches is light gray, calcareous clay loam. There are pebbles throughout this soil.

Included in mapping are small areas of Burchard soils on the lower part of side slopes and along drainageways. These soils make up 3 to 10 percent of the map unit.

Permeability is moderately slow. The available water capacity is high. Runoff is rapid. Natural fertility is low, and the content of organic matter is moderately low. The nitrogen and phosphorus levels are low. Reaction is mildly alkaline in the surface layer and moderately alkaline below the surface layer. This soil is moderately difficult to till because of the content of clay and the small stones on the surface.

Most of the acreage is used as pasture or rangeland. In some areas the soil is cultivated, but it is best suited to grasses.

This soil generally is not suited to cultivated crops under dryland management because of the very severe hazard of erosion and the steepness of slopes.

This soil is suited to use as pasture. Pasture generally is bromegrass or a mixture of bromegrass and alfalfa or orchardgrass and alfalfa. Overgrazing or improper haying methods reduce the protective cover and cause the plant population to deteriorate. A grass cover is highly effective in controlling erosion. Proper stocking, rotation grazing, and nitrogen fertilizer help to maintain maximum yields and keep the grasses in good condition. Timely mowing reduces weed competition.

Using this soil as rangeland is effective in controlling wind and water erosion. Overgrazing reduces the protective cover and causes the potential natural vegetation to deteriorate. It also can result in severe gully erosion and create major blowouts. Proper grazing use, timely deferment of grazing, and a planned grazing system help to maintain or improve the range condition.

This soil has good potential as habitat for rangeland wildlife. Destroying existing habitat should be avoided. Establishing new habitat or improving existing habitat helps considerably to increase wildlife populations.

This soil generally is not suited to trees and shrubs in windbreaks. Excessive steepness makes erosion an extreme hazard. Slopes are too steep for mechanical planting and care of trees in windbreaks. Onsite evaluation is needed to determine if the soil in some places can be planted to trees by hand.

This soil generally is not suited to sanitary facilities because of the steep slopes. A substitute site is needed. Steepness of slopes limits the use of this soil for houses and small commercial buildings. Onsite evaluation may show some areas where the soils are less sloping and can be graded to permit construction. Extensive cuts and fills generally are needed to provide a suitable grade for roads and streets. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Coarser material can be used for subgrade or base material to ensure better performance.

This soil is assigned to capability unit VIe-9, dryland. It is in Limy Upland range site and in windbreak suitability group 10.

StG—Steinauer clay loam, 30 to 50 percent slopes. This is a deep, very steep, excessively drained soil on side slopes of upland drainageways, abrupt breaks, deep gullies, and canyons. Areas are long and narrow and range from 8 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable clay loam about 7 inches thick. The transition layer is brown, friable, calcareous clay loam about 8 inches thick. The underlying material to a depth of about 60 inches is light gray, calcareous clay loam.

Included in mapping are areas of less sloping Burchard soils, areas of Hobbs soils on bottom lands along the drainageways, and areas of Monona soils on the lower part of the slopes. The included soils make up about 15 percent of the map unit.

Permeability is moderately slow. Runoff is rapid. The available water capacity is high. The content of organic matter is moderately low, and natural fertility is low. This soil is calcareous below a depth of 7 inches. There are small pebbles and stones throughout.

Most of the acreage is covered with native trees, shrubs, and grasses.

This soil is not suited to cultivated crops and to use as woodland because of the very steep slopes.

Native grasses and other vegetation should be left on this soil to provide grazing for livestock and food and cover for wildlife. If this soil is used as rangeland, careful management is needed to prevent damage to the plant community and consequent erosion. Proper grazing use, timely deferment of grazing, and a planned grazing system help to maintain or improve the range condition.

This soil is too steep for community development or installation of sanitary facilities. Construction of roads and streets across these areas generally requires deep landfills or bridges. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength.

This soil is assigned to capability unit VIIe-9, dryland. It is in Limy Upland range site and in windbreak suitability group 10.

ThC—Thurman loamy fine sand, 3 to 6 percent slopes. This is a deep, undulating, somewhat excessively drained soil on hummocky terraces of the Platte River. Areas range from 5 to 100 acres in size.

Typically, the surface layer is brown, loose loamy fine sand about 10 inches thick. The transition layer is

yellowish brown, very friable loamy fine sand about 6 inches thick. The underlying material to a depth of about 60 inches is yellowish brown fine sand. In a few small areas, the surface layer is loam or loamy sand.

Included in mapping are small areas of Simeon and Ovina soils. The Simeon soils are on higher and more undulating parts of the landscape, and the Ovina soils are on the lower part of slopes. The included soils make up about 10 percent of this map unit.

Permeability is rapid. The available water capacity is low. Runoff is slow. This soil is droughty because it is sandy throughout, and it is deficient in lime and nitrogen. The content of organic matter is moderately low, and natural fertility is low. The water intake rate is very high, and this soil releases moisture readily to plants. This soil is easily tilled within a wide range of moisture content. Reaction is slightly acid to a depth of about 10 inches and neutral below this depth.

Most of the acreage is cultivated. In some small areas, the soil is used as pasture or rangeland.

Under dryland management, this soil is suited to grain sorghum, corn, and wheat. The main limitation is droughtiness, and soil blowing is the main hazard. Conservation practices, for example, stripcropping, minimum tillage, and stubble mulching, help to prevent soil blowing. Keeping as much crop residue as possible on the surface helps to control soil blowing; a cover crop is also helpful. Returning crop residue to the soil helps to maintain or improve the content of organic matter and fertility.

Under irrigation, this soil is suited to corn, soybeans, and alfalfa. Soil blowing is the main hazard. The same practices that are used to control wind erosion under dryland management can be used under irrigation. Because this soil is undulating and rapidly permeable, a sprinkler irrigation system works best to distribute water evenly. Keeping tillage operations to a minimum helps to maintain tilth. Returning crop residue to the soil and applying fertilizer help to maintain or improve fertility.

Using this soil as rangeland is effective in controlling erosion. Because the soil is sandy and droughty, the native grasses are sparse and unproductive. Overgrazing reduces the protective cover and causes the plant community to deteriorate. The distribution of livestock on rangeland can be improved by correctly locating fences, watering places, and salting facilties.

This soil is suited to use as pasture, but it is seldom used for that purpose.

This soil has good potential as habitat for openland and rangeland wildlife. Destroying existing habitat should be avoided if possible. Establishing new habitat or improving existing habitat helps considerably to increase wildlife populations.

Septic tank absorption fields work well, but nearby water supplies, streams, ponds, lakes, or watercourses may be contaminated by seepage from the absorption field. Seepage is a severe problem for sewage lagoons. Lagoons need to be lined or sealed by chemical treatment. The soil is suited to use as sites for buildings. The sides of shallow excavations can be shored to prevent sloughing or caving. Grading is needed to modify the slope for small commercial buildings. The soil is suited to roads and streets. Areas where the soil has been disturbed need to be replanted as soon as possible to prevent soil blowing.

This soil is assigned to capability units IVe-5, dryland, and IVe-11, irrigated. It is in Sandy range site and in windbreak suitability group 5.

TkD—Thurman-Monona complex, 6 to 11 percent slopes. This complex consists of deep and strongly sloping soils on side slopes of the Platte River breaks. The Thurman soil is somewhat excessively drained, and the Monona soil is well drained.

These soils are in areas that are too closely intermingled to be mapped separately. The mapped areas are 70 to 75 percent Thurman soil and 25 to 30 percent Monona soil. The areas are irregular in shape and range from 25 to 200 acres in size.

Typically, the surface layer of the Thurman soil is dark brown, loose loamy fine sand about 7 inches thick. The transition layer is brown, loose loamy fine sand about 5 inches thick. The underlying material to a depth of about 60 inches is pale brown loamy fine sand in the upper part and light gray loamy sand in the lower part.

Typically, the surface layer of the Monona soil is grayish brown, very friable fine sandy loam about 9 inches thick. The subsoil is about 37 inches thick. It is brown, friable loam in the upper part, brown, friable silt loam in the middle part, and light yellowish brown, friable silt loam in the lower part. The underlying material to a depth of about 60 inches is very pale brown silt loam. In a few small areas, the surface layer is loam or silt loam.

Permeability is rapid in the Thurman soil and moderate in the Monona soil. Runoff is slow on the Thurman soil and moderate on the Monona soil. The available water capacity is low in the Thurman soil and high in the Monona soil. The content of organic matter is moderately low in the Thurman soil and moderate in the Monona soil. Natural fertility is low in the Thurman soil and high in the Monona soil. Tilth is good.

About half of the acreage is used for cultivated crops. The rest is used as pasture or rangeland.

Under dryland management, these soils are suited to grain sorghum, corn, and wheat. The main limitation is droughtiness. Soil blowing is the main hazard. Conservation practices such as stripcropping, minimum tillage, and stubble mulching help to prevent soil blowing. A cover crop is also helpful. Returning crop residue to the soil helps to maintain and increase the content of organic matter and to improve fertility.

These soils are suited to use as pasture. Proper stocking and rotation grazing help to keep the grasses in good condition and prevent erosion.

These soils are suited to use as rangeland. Using these soils as rangeland is effective in controlling

erosion. Because these soils generally are droughty and sandy, the native grasses are sparse and unproductive. Improper grazing use and overgrazing reduce the protective plant cover and cause the plant community to deteriorate, exposing the soil surface to erosion by wind. The distribution of livestock on rangeland can be improved by correctly locating fences, watering places, and salting facilities.

These soils are suited to those trees and shrubs that are adapted to sandy soil and tolerate droughty conditions. Droughtiness and severe soil blowing are the main hazards in establishing windbreaks. Undesirable grasses and weeds, which are highly competitive for moisture, can be controlled by cultivating between the trees and using selective herbicides. Cover crops can be planted in strips between the tree rows or adjacent to the windbreak to help control soil blowing. Seedlings and young trees need to be protected from livestock.

Septic tank absorption fields work well on the Thurman soil, but nearby water supplies may be contaminated by seepage. Land shaping and installing the absorption field on the contour generally are needed. Slope needs to be altered before constructing sewage lagoons. Lagoons need to be lined or chemically treated to prevent seepage. On the Thurman soil, slope is the main limitation for construction of houses and small commercial buildings. Slope can be modified by grading, and buildings can be designed to accommodate the slope. Because the Thurman soil is sandy, walls of shallow excavations tend to cave in. Shoring needs to be provided, or cutbanks can be sloped to give stability. The shrink-swell potential is a limitation on the Monona soil. Foundations and basement walls need to be strengthened and backfilled with coarse material to prevent damage caused by the shrinking and swelling. Frost action and low soil strength are limitations for local roads and streets on the Monona soil. Installing a gravel moisture barrier in the subgrade helps to prevent damage caused by frost action, and using coarser soil material for subgrade or base material helps to increase soil strength. On the Thurman soil, which has excessive slope, roads need to be designed to accommodate the slope, and the disturbed areas need to be replanted as soon as possible to control soil blowing. An onsite investigation is needed to determine the type of soil before starting any construction activity.

These soils are assigned to capability units IVe-5, dryland, and IVe-11, irrigated. The Thurman soil is in Sandy range site and in windbreak suitability group 5, and the Monona soil is in Silty range site and in windbreak suitability group 3.

UaF2—Uly silt loam, 11 to 15 percent slopes, eroded. This is a moderately steep, well drained soil on side slopes of uplands along intermittent drainageways. Most of the original surface layer has eroded away, and in areas where the soil is under cultivation, the rest is mixed with the subsoil. Small rills and gullies are common after heavy rains. Most areas are dissected by shallow drainageways and by a few gullies. These gullies generally are not more than 6 feet deep or wide. The areas are long and narrow and range from 5 to 60 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The upper part of the subsoil is brown, friable silty clay loam about 6 inches thick, and the lower part is pale brown, friable silt loam about 9 inches thick. The underlying material is light brownish gray silt loam in the upper part. In the lower part it is light gray, calcareous silt loam to a depth of 60 inches.

Included in mapping and making up less than 20 percent of the map unit are small areas of Kezan silt loam along intermittent drainageways.

Permeability is moderate. The available water capacity is high. Runoff is rapid. Reaction is neutral in the surface layer and the subsoil and moderately alkaline in the underlying material. Natural fertility is medium, and the content of organic matter is low. This soil releases moisture readily to plants.

Most of the acreage is used as pasture or rangeland, but in some small areas, the soil is in cultivated crops. This soil generally is not suited to cultivated crops because of the steepness of slopes and because erosion is a very severe hazard.

This soil is suited to use as pasture. Pasture generally consists of bromegrass or a mixture of bromegrass and alfalfa or orchardgrass and alfalfa. Overgrazing or improper haying methods reduce the protective cover and cause the plant population to deteriorate. A grass cover is highly effective in controlling erosion. Proper stocking, rotation grazing, and fertilizing with nitrogen help to maintain maximum yields and keep the grasses in good condition. Timely mowing reduces weed competition.

Using this soil as rangeland is effective in controlling wind and water erosion. Overgrazing or improper haying methods reduce the protective cover and cause the potential natural plant community to deteriorate. Overgrazing can result in severe soil losses by water erosion. Proper grazing use, timely deferment of grazing or haying, and planned grazing systems help to maintain or improve the range condition.

This soil is suited to trees and shrubs in windbreaks. Water erosion is a very severe hazard. Competition for moisture from grasses and weeds is the major concern in establishing seedlings. Planting trees on the contour and cover crops between the tree rows helps to reduce erosion. Herbicides and cultivation between the tree rows help to control grasses and weeds. Seedlings need to be protected from livestock.

This soil is not suited to use as a site for sanitary facilities unless the slope is altered. The steepness of slopes severely limits the use of this soil for building sites. The slope needs to be altered before construction starts. Onsite investigation may locate small areas of

less sloping soil that is better suited to use as sites for building or community development. Slope and low soil strength are limitations for roads and streets. Slope can be altered by cutting and filling as necessary. Low strength can be increased by adding coarser material and by compaction.

This soil is assigned to capability unit VIe-8, dryland. It is in Silty range site and in windbreak suitability group 3.

UbF—Uly-Coly silt loams, 15 to 30 percent slopes. These are steep, somewhat excessively drained soils on side slopes of uplands along intermittent drainageways. Most areas are dissected by shallow drainageways and by a few gullies. The gullies generally are not more than 6 feet deep or wide.

These soils are in areas that are too closely intermingled to be mapped separately. The mapped areas are about 55 percent Uly soil and 35 percent Coly soil. The areas are long and narrow and range from 5 to 30 acres in size.

Typically, the surface layer of the Uly soil is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is pale brown, friable silt loam about 15 inches thick. The underlying loess material to a depth of about 60 inches is very pale brown, calcareous silt loam.

Typically, the surface layer of the Coly soil is grayish brown, friable silt loam about 5 inches thick. The transition layer is pale brown, friable, calcareous silt loam about 4 inches thick. The underlying loess material to a depth of about 60 inches is very pale brown, calcareous silt loam that has numerous white lime concretions.

Included in mapping are small areas of Kezan soils along intermittent drainageways. These soils make up about 10 percent of the map unit.

Permeability is moderate. The available water capacity is high. Runoff is rapid. Reaction in the Uly soil is neutral in the surface layer and the subsoil and mildly alkaline in the underlying material. The Coly soil is mildly or moderately alkaline throughout. The content of organic matter is moderately low. Natural fertility is medium in the Uly soil and low in the Coly soil. Moisture is readily released to plants.

Most of the acreage is in pasture, but in some small areas, the soils are used for cultivated crops.

These soils are not suited to cultivated crops because of the steep slopes. In the small areas where these soils are used for row crops, erosion is very difficult to control. Although the outer edges of some mapped areas are part of adjacent cultivated fields, these soils are best suited to a permanent plant cover.

These soils are suited to use as pasture. This use is effective in controlling erosion, but overgrazing can increase the hazard of erosion.

The soils are suited to use as rangeland. Proper grazing use and brush management help to keep the grasses healthy and the soil in good condition.

The topography generally is too steep for mechanical planting and care of windbreaks. Onsite evaluation is needed to determine if some areas can be planted to trees and shrubs by hand.

These soils generally are not suited to sanitary facilities because of the steep slopes. A substitute site is needed. The steep slopes severely limit use of the soils for dwellings and buildings. Onsite evaluation may show some areas where the soils are less sloping and can be graded to permit construction. Extensive cuts and fills are generally needed to provide a suitable grade for roads and streets. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength.

These soils are assigned to capability unit VIe-1, dryland. The Uly soil is in Silty range site, and the Coly soil is in Limy Upland range site. Both soils are in windbreak suitability group 10.

UcF2—Uly-Coly silt loams, 15 to 25 percent slopes, eroded. These are deep, steep, somewhat excessively drained soils on the breaks of the Platte River Valley. The soils are also on side slopes of uplands adjacent to intermittent drainageways and creeks. Most of the surface layer was removed by erosion when these soils were under cultivation. There still are small rills and gullies in many pastures. If these soils are cultivated, rills and gullies form easily under heavy rains.

These soils are in areas that are too closely intermingled to be mapped separately. The mapped areas are about 50 percent Uly soil and 40 percent Coly soil. They range from 20 to 200 acres in size.

Typically, the surface layer of the Uly soil is brown, friable silt loam about 6 inches thick. The subsoil is light brownish gray, friable silt loam about 14 inches thick. The underlying material to a depth of about 60 inches is light gray, calcareous silt loam that has many coarse, prominent, strong brown relict mottles.

Typically, the surface layer of the Coly soil is grayish brown, friable silt loam about 6 inches thick. The transition layer is light brownish gray, calcareous silt loam about 5 inches thick. The upper part of the underlying material is pale yellow, calcareous silt loam about 23 inches thick. The lower part to a depth of about 60 inches is light gray, calcareous silt loam.

Included in mapping are areas of Kezan soils next to drains that dissect the mapped areas. These soils make up less than 10 percent of the map unit.

Permeability is moderate, and the available water capacity is high. Runoff is rapid. Reaction in the Uly soil is neutral in the surface layer and the subsoil and mildly or moderately alkaline in the underlying material. Reaction in the Coly soil is mildly or moderately alkaline throughout. Natural fertiliy is low, and the content of organic matter is low. Moisture is readily released to plants. Tilth is good.

Most of the acreage of these soils has been farmed in the past but is now used as pasture. In some small areas, the soils are still in cultivation.

These soils are not suited to cultivated crops because of the steep slopes. In the small areas where these soils

are used for row crops, water erosion is very difficult to control. Although the outer edges of some mapped areas are part of adjacent fields, these soils are best suited to a permanent plant cover.

These soils are suited to use as pasture. Pasture generally is bromegrass or a mixture of bromegrass and alfalfa or orchardgrass and alfalfa. Overgrazing or improper haying methods reduce the protective cover and cause the plant population to deteriorate. A grass cover is highly effective in controlling erosion. Proper stocking, rotation grazing, and nitrogen fertilizer help to maintain maximum yields and keep the grasses in good condition. Timely mowing reduces weed competition.

The soils are suited to use as rangeland. Proper grazing use and brush management help to keep the grasses healthy and the soil in good condition.

The soils generally are too steep for mechanical planting and care of trees and shrubs in windbreaks. Onsite evaluation is needed to determine if some areas can be planted to trees and shrubs by hand.

These soils generally are not suited to sanitary facilities because of the steep slopes. The steep slopes severely limit these soils for dwellings and buildings. Onsite evaluation may show some areas where the soils are less sloping and can be graded to permit construction. Extensive cuts and fills are generally needed to provide a suitable grade for roads and streets. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength.

These soils are assigned to capability unit VIe-9, dryland. The Uly soil is in Silty range site, and the Coly soil is in Limy Upland range site. Both soils are in windbreak suitability group 10.

UhF2—Uly-Hobbs silt loams, 0 to 30 percent slopes, eroded. These are somewhat excessively drained, moderately steep and steep soils on side slopes and nearly level, well drained soils on the bottom of upland drainageways. The Uly soil is on side slopes of drains. The Hobbs soil is adjacent to the drains and is occasionally flooded.

The soils are in areas that are too closely intermingled or too small to be mapped separately. The mapped areas are about 55 to 70 percent Uly soil and about 15 to 30 percent Hobbs soil. They range from 5 to 25 acres in size.

Typically, the surface layer of the Uly soil is mixed brown and pale brown, friable silt loam about 5 inches thick. Most of the surface layer has been lost by erosion. The subsoil is pale brown, friable silt loam about 27 inches thick. The underlying material to a depth of about 60 inches is very pale brown, calcareous silt loam.

Typically, the surface layer of the Hobbs soil is brown, friable silt loam about 6 inches thick. The upper part of the underlying material is brown, friable silt loam, the middle part is grayish brown, friable silt loam, and the lower part to a depth of about 60 inches is dark gray silt loam.

Included in mapping are some areas of Kezan soils on the bottom of drainageways. These soils make up about 15 percent of this map unit.

Permeability is moderate. The available water capacity is high. Runoff is rapid on the Uly soil and slow on the Hobbs soil. The content of organic matter is low in the Uly soil and moderate in the Hobbs soil. Natural fertility is low in the Uly soil and high in the Hobbs soil. The Uly soil is somewhat excessively drained, and the Hobbs soil is well drained.

Most of the acreage is in pasture. In some small areas where they are associated with less sloping soils, these soils are cultivated. In many areas, the soils were formerly cultivated but are now in grass.

Under dryland management, these soils are not suited to cultivated crops because of the steep slopes. In the small areas where these soils are used for row crops, soil erosion is very severe. Small rills and gullies form readily. Although the outer edges of some mapped areas are included in adjacent cultivated fields, these soils are best suited to a permanent plant cover.

Using these soils as pasture is effective in controlling erosion. Overstocking and overgrazing reduce the protective plant cover and cause the plant community to deteriorate. A planned grazing system and proper grazing use help to keep the range plants and soil in good condition.

The topography generally is too steep for mechanical planting and care of trees in windbreaks. Onsite evaluation is needed to determine if the soils in some areas can be planted to trees and shrubs by hand.

These soils have good potential for use as habitat for upland game birds and deer. Water is readily available, and in most places, the soils have plant cover that is highly advantageous to wildlife.

These soils generally are not suited to sanitary facilities and dwellings because of the steepness of the Uly soil and flooding on the Hobbs soil. A substitute site is needed. Slope on the Uly soil, occasional flooding on the Hobbs soil, and low strength are limitations for roads. Slope can be altered, and soil strength can be increased by excavating and using sandier material as backfill or road base. Protection against flooding is needed on the Hobbs soil.

These soils are assigned to capability unit VIe-8, dryland. The Uly soil is in Silty range site, and the Hobbs soil is in Silty Overflow range site. Both soils are in windbreak suitability group 10.

UkC2—Uly Variant silty clay loam, 3 to 6 percent slopes, eroded. This is a deep, gently sloping, moderately well drained soil on side slopes that divide different levels of stream terraces on the Blue River bottoms. This soil contains moderate amounts of soluble salts and exchangeable sodium. Salts have accumulated through either lateral seepage or capillary action. Sheet and rill erosion have removed most of the surface layer. Under cultivation, the remaining surface layer is mixed

with the subsoil. Areas generally are long and narrow and range from 10 to 60 acres in size.

Typically, the surface layer is grayish brown, very firm silty clay loam about 6 inches thick. The subsoil is light yellowish brown, friable silty clay loam about 9 inches thick. There are visible salt crystals in the lower part of the subsoil. The underlying material to a depth of about 60 inches is very pale brown, calcareous silt loam that has strong brown mottles throughout and gray mottles in the lower part. In some areas, the soil is less saline-alkali than is typical.

Included in mapping are a few small areas of Hall soils in slightly lower positions on the landscape. These included soils make up about 5 percent of the map unit.

Permeability is moderately slow. The available water capacity is high. The water intake rate for irrigation is moderately low. The content of organic matter is moderately low, and natural fertility is low. Tilth is poor because of the saline-alkali conditions. Surface cracking can occur when the soil dries out.

Most of the acreage is under cultivation. In a few very small areas, the soil is in native grasses.

Under dryland management, this soil is poorly suited to corn, wheat, soybeans, and grain sorghum. The main problems are a severe hazard of erosion and the soluble salts and exchangeable sodium, which cause poor tilth and restrict the movement of water, air, and roots in the soil. This soil tends to be droughty because water infiltrates slowly. Because of salinity, seed germination on this soil is poor, plants are stunted, and grain is of poor quality. Chemical amendments can improve saline-alkali conditions. Returning crop residue to the soil and regularly adding organic matter help to improve tilth and reduce erosion.

Under irrigation, a sprinkler system is most suitable because of the slope. Water needs to be applied at a rate that does not exceed the intake rate of the soil. This soil is poorly suited to corn, grain sorghum, wheat, and soybeans because of the saline-alkali conditions. Keeping crop residue on the surface adds organic matter and helps to improve tilth, to maintain and improve fertility, and to raise the water intake rate.

This soil is suited to use as pasture or rangeland. Overgrazing or grazing when the soil is too wet, however, results in surface compaction and poor tilth. Proper range use, deferred grazing, a planned grazing system, and restricted use in very wet periods help to keep the plants and soil in good condition. Only those grasses that are adapted to saline-alkali conditions should be planted.

This soil is poorly suited to trees and shrubs in windbreaks. Saline-alkali conditions and soil cracking caused by the shrinking and swelling of the soil are the main problems. Weeds can be controlled by cultivating between the rows with conventional equipment, hand hoeing and rototilling around trees, and using appropriate herbicides. Soil cracking allows the roots of newly established seedlings to dry out. This cracking can be controlled by supplemental irrigation and light cultivation. Only those trees and shrubs that are adapted to moderately well drained sites and saline-alkali conditions should be planted.

This soil is not suited to septic tank absorption fields. Slope needs to be altered for construction of sewage lagoons. Lagoons can be lined with less permeable material to prevent seepage. Foundations of buildings need to be strengthened and backfilled with coarser material to prevent damage by the shrinking and swelling of the soil. For roads and streets, mixing the soil material with additives helps to control the shrinking and swelling. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Frost action can be controlled by surface drainage and a moisture barrier in the subgrade.

This soil is assigned to capability units IVs-1, dryland, and IVs-1, irrigated. It is in Saline Lowland range site and in windbreak suitability group 9N.

WoB—Wood River silt loam, 1 to 3 percent slopes. This is a deep, very gently sloping, moderately well drained soil on second bottom lands of the Big Blue River. Areas range from 15 to 100 acres in size.

Typically, the upper part of the surface layer is dark grayish brown, very friable silt loam. The lower part is gray, very friable silt loam. The surface layer is about 9 inches thick. The upper part of the subsoil is dark grayish brown, very firm silty clay, the middle part is brown, very firm silty clay, and the lower part is pale brown, firm, calcareous silty clay loam. The subsoil is about 24 inches thick. The upper part of the underlying material is very pale brown, calcareous silt loam about 6 inches thick. The lower part to a depth of about 60 inches is very pale brown, calcareous silt loam. In some areas, the subsoil is less clayey and is noncalcareous.

Included in mapping are a few very small areas of Hall soils. These soils make up about 5 percent of the map unit.

Permeability is slow. The available water capacity is high. The water intake rate for irrigation is low. Runoff is slow. The seasonal high water table is at a depth below 60 inches. Natural fertility is medium, and the content of organic matter is moderate. The shrink-swell potential is high. This soil is moderately alkaline in the lower part and moderately affected by salinity. This soil releases moisture slowly to plants. Tilth is poor.

Most of the acreage is under cultivation.

Under dryland management, this soil is poorly suited to corn, wheat, soybeans, and grain sorghum. The main problem is the moderate amount of soluble salts and exchangeable sodium, which cause poor tilth and restricted movement of water, air, and roots in the soil. This soil tends to be droughty because water infiltrates slowly. In areas of salt accumulation, seed germination is poor, plants are stunted, and grain is of poor quality. Adequate drainage and chemical amendments can

improve saline-alkali conditions. Returning crop residue to the soil and regularly adding organic matter help to improve tilth and to reduce erosion.

This soil is poorly suited to gravity irrigation systems. Under a sprinkler irrigation system, this soil is suited to corn, grain sorghum, wheat, and soybeans. The same management procedures that apply to dryland management apply to irrigation management.

This soil is suited to use as pasture. Overgrazing or grazing when the soil is too wet, however, results in surface compaction and poor tilth.

The soil is also suited to use as rangeland. Proper grazing use, deferred grazing, a planned grazing system, and restricted grazing in very wet periods help to keep the plants and soil in good condition. Only those grasses that are adapted to saline-alkali conditions should be planted.

This soil is poorly suited to trees and shrubs in windbreaks. Abundant and persistent weeds, saline-alkali conditions, and soil cracking caused by the shrinking and swelling of the soil are the main concerns in management. Weeds can be controlled by cultivating between the rows with conventional equipment, by hand hoeing or rototilling around trees, and by using appropriate herbicides. Soil cracking, which allows air to dry out roots of newly established seedlings, can be controlled by supplemental irrigation and light cultivation. Trees and shrubs that tolerate moderately saline-alkali conditions should be selected for planting.

The slow permeability is a severe limitation to the use of this soil for septic tank absorption fields. A substitute site should be selected. For sewage lagoons, a minor amount of grading is required to modify the slope and shape the lagoon. Lagoons need to be lined or sealed to prevent seepage. This soil is poorly suited to use as building sites because of the high shrink-swell potential. Foundations and basement walls need to be strengthened and backfilled with sandier material to prevent damage caused by the shrinking and swelling. The shrink-swell potential and low soil strength are severe limitations for local roads and streets. Mixing the base material for roads and streets with additives helps to control shrinking and swelling. Using sandier material for subgrade or base material helps to prevent damage caused by shrinking and swelling and to increase soil strength.

This soil is assigned to capability units IVs-1, dryland, and IIIs-2, irrigated. It is in Saline Lowland range site and in windbreak suitability group 3.

Zk—Zook silt loam, overwash, 0 to 2 percent slopes. This is a deep, nearly level, poorly drained soil on bottom lands. It is occasionally flooded. Areas are irregular in shape and range from 5 to 160 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 13 inches thick. The upper part of the subsoil is dark gray, very firm silty clay about 14 inches thick. The lower part of the subsoil is mixed gray and olive, very firm silty clay about 17 inches thick. The upper part of the underlying material is light brownish gray silt loam about 10 inches thick. The lower part to a depth of about 60 inches is olive gray silt loam. In some areas, lime is closer to the surface.

Included in mapping are small areas of Lamo soils, which make up about 5 percent of the map unit.

Permeability is slow, and the available water capacity is high. Runoff is slow. This soil has a seasonal high water table that fluctuates between depths of about 1 and 3 feet in winter and early in spring. Wetness in spring makes this soil slow to warm up and can delay seeding and cultivation. Water tends to stand on the surface during periods of heavy rainfall because of the slow permeability of the subsoil. The water intake rate is low, and this soil releases moisture slowly to plants. The content of organic matter is moderate. Natural fertility is high. The soil can be worked within a moderately wide range of moisture content. Reaction is neutral in the surface layer and the upper part of the subsoil and mildly alkaline in the lower part of the subsoil and underlying material. The shrink-swell potential is high.

Most of the acreage is used for cultivated crops. In some areas, the soil is irrigated.

Under dryland management, this soil is suited to wheat, soybeans, corn, and grain sorghum. Excess wetness caused by the water table or flooding is the main concern in management, because it delays tillage and planting. If suitable outlets are available, open drains help to remove surface water and tile drains help to lower the water table. In dry years, however, the high water table is beneficial to crops. Conservation practices, for example, minimum tillage, stripcropping, and stubble mulching, help to prevent soil blowing. Returning crop residue to the soil helps to maintain and improve the content of organic matter and fertility. Spreading barnyard manure helps to maintain fertility.

Under irrigation, this soil is suited to corn, soybeans, and alfalfa. Wetness commonly delays tillage in spring. Tile or open ditches can be installed if a suitable outlet is available. Land leveling helps to improve surface drainage and increases the efficiency of irrigation systems. Returning crop residue to the soil and applying barnyard manure help to maintain fertility.

This soil is suited to those trees and shrubs that tolerate a seasonal high water table and occasional flooding. Undesirable grasses and weeds are a concern in establishing windbreaks, because they compete with the young trees for moisture and sunlight. Weeds can be controlled by cultivation between tree rows and by selective herbicides.

This soil is not suited to septic tank absorption fields because of flooding, slow permeability, and a seasonal high water table. Sewage lagoons need to be constructed on fill material to raise the bottom of the lagoon to a sufficient height above the water table. Lagoons need to be diked as protection against flooding. This soil is not suited to use as building sites because of

flooding, the seasonal high water table, and the shrinking and swelling of the soil. Constructing roads on suitable and well compacted fill material above flood level and providing adequate side ditches and culverts help to protect roads from flood damage and wetness. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Damage to roads by frost action can be reduced by surface drainage and a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is assigned to capability units IIw-4, dryland, and IIw-2, irrigated. It is in Clayey Overflow range site and in windbreak suitability group 2W.

Zo—Zook silty clay loam, 0 to 2 percent slopes. This is a nearly level, poorly drained soil on bottom lands. This soil is on slightly lower positions than adjoining soils and is occasionally flooded. Areas are irregular in shape and range from 10 to 300 acres in size.

Typically, the surface layer is very dark gray, firm silty clay loam about 6 inches thick. The subsurface layer is 31 inches thick. The upper part is very dark gray, firm silty clay, and the lower part is dark gray, firm silty clay loam. The subsoil is dark gray silty clay 14 inches thick. The underlying material is light olive gray silty clay loam. In a few small areas, the surface layer is silt loam.

Included in mapping are small areas of Lamo soils in slightly higher positions on the landscape. The included soils make up 5 to 10 percent of the map unit.

Permeability is slow, and the available water capacity is high. Runoff is slow. This soil has a seasonal high water table that fluctuates between depths of about 1 and 3 feet in winter and early in spring. Wetness in spring makes this soil slow to warm up and can delay seeding and cultivation. Water tends to stand on the surface during periods of heavy rainfall because of the slow permeability. The water intake rate is low. This soil releases moisture slowly to plants. The content of organic matter is moderate, and natural fertility is high. This soil can be worked only within a narrow range of moisture content. Reaction is neutral throughout. The shrink-swell potential is high.

Most of the acreage is cultivated. In a few areas, the soil is in native grasses that are used for grazing or mowed for hay.

Under dryland management, this soil is suited to wheat, soybeans, corn, and grain sorghum. Wetness caused by the high water table or flooding is the main concern in management, because it delays tillage and planting. If suitable outlets are available, open drains help remove the surface water and tile drains help to lower the water table. In dry years, however, the high water table is beneficial to crops. Conservation practices, for example, minimum tillage, stripcropping, and stubble mulching, help prevent soil blowing. Returning crop residue to the soil helps to maintain and improve the content of organic matter and fertility. Using commercial fertilizers also helps to maintain fertility.

Under irrigation, this soil is suited to corn, soybeans, and alfalfa. Wetness commonly delays tillage in spring. Tile or open ditches can be installed if a suitable outlet is available. Land leveling helps to improve surface drainage and increases the efficiency of irrigation systems. Returning crop residue to the soil and applying fertilizer help to maintain fertility.

The soil is also suited to use as pasture, but it is seldom used for that purpose.

This soil is suited to trees and shrubs that tolerate clayey soil, a high water table, and occasional flooding. Undesirable grasses and weeds are a concern in establishing windbreaks, as they compete with the young trees for moisture and sunlight. Weeds can be controlled by cultivation between tree rows and by herbicides.

This soil is not suited to septic tank absorption fields because of flooding, slow permeability, and a seasonal high water table. Sewage lagoons need to be constructed on fill material to raise the bottom of the lagoon sufficiently above the seasonal high water table. Lagoons need to be diked as protection against flooding. This soil is not suited to use as building sites because of flooding, the seasonal high water table, and the shrinking and swelling of the soil. A substitute site is needed. Constructing roads on suitable and well compacted fill material above flood level and providing adequate side ditches and culverts help to protect roads from flood damage and wetness. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low soil strength. Damage to roads by frost action can be reduced by surface drainage and a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is assigned to capability units IIw-4, dryland, and IIw-2, irrigated. It is in Clayey Overflow range site and in windbreak suitability group 2W.

prime farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in Butler County are listed.

Each year thousands of acres of land throughout the United States are converted from agricultural to industrial, urban, and other uses. Some of the converted land is prime farmland.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in providing the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have soil properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland, or they may be in other uses. They are either used for producing food or fiber or are available for these uses. Urban and built-up land or water areas cannot be considered prime farmland.

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not flooded frequently during the growing season. The slope ranges mainly from 0 to 5 percent.

Some soils that have a high water table qualify as prime farmland soils only in areas where this limitation has been overcome by drainage. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information on the criteria for prime farmland soils can be obtained at the local office of the Soil Conservation Service.

prime farmland in Butler County

About 232,750 acres, or nearly 57 percent of the county, is prime farmland. A recent trend in land use in Butler County has been the conversion of some prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, difficult to cultivate, and less productive than prime farmland.

The following map units, or soils, make up prime farmland in Butler County. Restrictions are shown in parentheses after the name of the map unit. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed soil map units." This list does not constitute a recommendation for a particular land use.

Bd Blendon fine sandy loam, 0 to 2 percent slopes
BdC Blendon fine sandy loam, 2 to 6 percent slopes
Bf Blendon-Muir complex, 0 to 2 percent slopes
Br Brocksburg sandy loam, 0 to 2 percent slopes
Bu Butler silt loam, 0 to 1 percent slopes (where drained)
CoB Cozad silt loam, 1 to 3 percent slopes
Gb Gibbon silty clay loam, 0 to 2 percent slopes (where drained)
Gr Grigston silt loam, 0 to 1 percent slopes
Ha Hall silt loam, 0 to 1 percent slopes
Hc Hastings silt loam, 0 to 1 percent slopes
HcB Hastings silt loam, 1 to 3 percent slopes
HcC Hastings silt loam, 3 to 6 percent slopes
HdD2 Hastings silty clay loam, 3 to 6 percent slopes, eroded
Hg Hobbs silt loam, 0 to 1 percent slopes
HkB Holder silt loam, 1 to 3 percent slopes
JuC Judson silt loam, 2 to 6 percent slopes
La Lamo silty clay loam, 0 to 2 percent slopes drained)
LoC2 Longford silty clay loam, 2 to 6 percent slopes, eroded
MnC Monona silt loam, 2 to 6 percent slopes
Mu Muir silt loam, 0 to 1 percent slopes
MuB Muir silt loam, 1 to 3 percent slopes
PaC2 Pawnee clay loam, 3 to 6 percent slopes, eroded
PoC2 Ponca silty clay loam, 2 to 6 percent slopes, eroded

Sh Sharpsburg silty clay loam, 0 to 2 percent slopes
ShC Sharpsburg silty clay loam, 2 to 6 percent slopes
ShC2 Sharpsburg silty clay loam, 2 to 6 percent slopes, eroded
WoB Wood River silt loam, 1 to 3 percent slopes
Zk Zook silt loam, overwash, 0 to 2 percent slopes (where drained)
Zo Zook silty clay loam, 0 to 2 percent slopes (where drained)

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and windbreaks; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

William E. Reinsch, conservation agronomist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

According to Nebraska Agriculture Statistics, 90 percent of the total area of Butler County is used as cropland. Most of the land is in cultivated crops. The largest acreage is in corn and sorghum. Other crops are small grains, soybeans, and alfalfa. About 63 percent of the cropland is dry-farmed.

dryland management

Most of the soils in Butler County are suited to use as cropland. In many places, however, erosion is a severe hazard and suitable conservation practices are required to control erosion. Good management practices on dry-farmed cropland also help to reduce runoff, conserve moisture, and improve tilth.

Terraces, contour farming, grassed waterways, and conservation tillage systems that keep crop residue on the surface help to reduce water erosion. Keeping crop residue on the surface or growing a protective plant cover helps to prevent sealing and crusting of the soil during and after heavy rains. In winter, stubble catches drifting snow, which provides additional moisture. Soil blowing is a minor hazard in Butler County, but the same management practices that control water erosion can control soil blowing. Crop residue use, conservation tillage, contour stripcropping, and narrow field windbreaks are effective. The overall hazard of erosion can be reduced if the more productive soils are used for row crops and the steeper, more erodible soils are used for small grains, alfalfa, or other close-growing crops or for hay and pasture. Proper use of the land can reduce the hazard of erosion in many places.

In Butler County, rainfall is the limiting factor for crop production, and a cropping system needs to be planned to fit the soils in each field. The sequence of crops grown on a field, in combination with the practices needed for the management and conservation of the soil, is known as a cropping system. A cropping system for dry-farmed soils should preserve soil tilth and fertility, maintain a plant cover that protects the soil from erosion, and help to control weeds, insects, and disease.

Cropping systems vary according to the soils on which they are used. For example, in a crop sequence on Monona silt loam, 11 to 17 percent slopes, grass and legumes should predominate. However, on Hall silt loam, 0 to 1 percent slopes, a high percentage of row crops can be grown without imperiling the fertility and tilth of the soil.

The Fillmore and Scott soils are subject to ponding. If the water level cannot be lowered sufficiently for most crops to thrive, crops can be planted that tolerate wetness.

In dryland farming, the cultivation process should be cut down to its essentials. Soils need to be worked to prepare a seedbed, to control weeds, and to provide a favorable place for plants to grow. Excessive tillage, however, breaks down the granular structure in the surface layer that is needed for good tilth. Till-plant, disc-plant, and chisel-plant are conservation tillage systems that are well suited to row crops. Grasses can be established by drilling into a cover of stubble without further preparation.

Soil tests can determine the need for additional nutrients on all soils that are used for cultivated crops or for pasture. Under dryland management, the kind and amount of fertilizer to be applied should be based on the kind of crop grown, the results of soil tests, and the moisture content of the soil at the time of application. If the subsoil is dry and rainfall is low, the amount of fertilizer applied should be slightly less than that needed on moist soil. Nitrogen fertilizer benefits all crops except legumes on all the soils. Phosphorus and zinc are needed on the more eroded soils and in cut areas after construction of terraces or diversions. Dry-farmed soils need less fertilizer than irrigated soils, because the plant population is lower.

Herbicides are highly effective in eliminating weeds; however, it is important to apply the correct kind of herbicide at the proper rate. The colloidal clay and humus fractions of the soil are associated with most of the chemical activity of the soil. Herbicides can damage crops on sandy soils, which are low in colloidal clay, and on soils that have a moderately low or low content of organic matter. The rate at which herbicide is applied needs to be lowered on these soils. Keeping field boundaries on the contour helps to maintain the content of organic matter in the surface layer, thereby lessening the danger of damage from herbicides.

Good management practices to reduce erosion on soils of capability classes I, IIw, and IIIw include leaving crop residue on the surface, adding fertilizer, and spreading barnyard manure. On soils of classes IIe and IIs, good management includes leaving crop residue on the soil over winter, contour farming, grassed waterways, and a conservation tillage system that leaves 3,000 pounds per acre of corn or sorghum residue or 1,500 pounds per acre of small grain residue on the surface after the following crop is planted. On slopes of more than 10 percent, a high percentage of grasses and legumes is needed in the cropping system, or a conservation tillage system of row crop planting that leaves more than 3,000 pounds per acre of corn or sorghum residue on the surface after the next crop is planted is needed to reduce water erosion to an acceptable level.

Irrigation management

About 37 percent of all cropland in Butler County is irrigated. Corn is grown on 86 percent of the irrigated cropland. A smaller acreage is in sorghum, soybeans, and alfalfa. Water for irrigation is drawn almost entirely from wells.

Either furrow or sprinkler systems of irrigation are suited to corn, sorghum, and soybeans. Border, contour ditch, corrugation, or sprinkler systems can be used for alfalfa.

On soils that are well suited to irrigation, the crop sequence consists mainly of row crops. A crop sequence that includes different row crops, small grains, and alfalfa or grass helps to control the plant diseases and insects that are common if the same crop is grown year after year.

Gently sloping soils, for example, Hastings silt loam, 3 to 6 percent slopes, are subject to water erosion if they are furrow-irrigated down the slope. Under furrow irrigation, these soils can be bench-leveled on the contour or irrigated along contour furrows in combination with parallel terraces.

Land leveling can increase irrigation efficiency because it results in a more even distribution of water. The efficiency of furrow irrigation is improved if a tailwater recovery system is added. A tailwater recovery pit is installed at the end of a furrow-irrigated field to trap excess irrigation water. This water can then be pumped to the upper end of the field or to a nearby field and used again. This practice also helps to conserve the supply of ground water.

A sprinkler irrigation system applies water at a rate that allows the soil to absorb the water without runoff. A sprinkler irrigation system can be used on the more sloping soils as well as on the nearly level ones. On gently sloping or sloping soils, for example, Hastings silt loam, 3 to 6 percent slopes, or Hastings silt loam, 6 to 11 percent slopes, eroded, if a sprinkler irrigation system is used, the same conservation practices that control water erosion on nonirrigated cropland need to be applied. Suitable practices include terraces, contour farming, grassed waterways, and conservation tillage that leaves a protective cover of crop residue on the soil after the row crop is planted. These practices also help to conserve the supply of surface water by reducing evaporation and increasing the intake of rainfall. If an adequate supply of water is available, sprinkler irrigation is most satisfactory on coarse textured, rapidly permeable soils, for example, Simeon loamy sand, 0 to 3 percent slopes, on which a furrow system is not

practical. Because the water can be carefully controlled, sprinkler systems have special uses in conservation, for example, establishing new pasture on moderately steep slopes. However, wind drift can cause the water to be unevenly distributed, and in summer much water is lost through evaporation.

There are two general kinds of sprinkler systems: one kind is set up at a certain location and left there until a specified amount of water is applied; the second kind is a moving device that has sprinklers revolving on a central pivot.

Because soil holds only a limited amount of water, irrigation water is applied at regular intervals to keep the moisture content of the soil within a given range. The interval varies according to the crop and the time of year. Water should be applied no faster than the soil can absorb it. Irrigated silt loam and silty clay loam soils in Butler County hold about 2 inches of available water per foot of soil depth. A soil that is 4 feet deep and is planted to a crop that sends its roots to that depth can hold about 8 inches of available water for that crop.

For maximum efficiency, an irrigation system should start operating when about one-half of the stored water has been used by the plants. If a soil holds 8 inches of available water, irrigation should be started when about 4 inches of water has been used by the plants. An irrigation system should be planned to replace the amount of water that is used by the crop.

All of the soils in Nebraska are placed in irrigation design groups, which are described in the Nebraska Irrigation Guide (*7*). Arabic numbers designate the irrigation design group to which a soil belongs.

Assistance in planning and designing an irrigation system is available through the local office of the Soil Conservation Service or the county agricultural agent.

pasture and hayland management

Areas in hay or pasture should be managed for maximum production. Once the pasture is established, the grasses need to be kept productive. A system of rotation grazing that meets the needs of the plants and promotes uniform use of forage is needed for highest production. Many forages are a good source of minerals, vitamins, proteins, and other nutrients, and well managed pasture can provide a balanced ration throughout the growing season. Irrigated pasture requires a high level of management to produce maximum returns.

A mixture of grasses and legumes can be grown on many kinds of soil, and with proper management the grasses and legumes can return a fair profit. Grasses and legumes are compatible with grain crops in a crop rotation and have beneficial soil-building effects. Because grasses and legumes improve tilth, add organic matter, and reduce erosion, they are ideal for use in a conservation cropping system.

Grasses and legumes that are grown for pasture and hay crops, both dryland and irrigated, need additional plant nutrients to attain maximum production. Soil tests can determine the kind and amount of fertilizer needed.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIe-6.

The acreage of soils in each capability class and subclass is shown in table 6. In Butler County, about 26 percent of the total acreage is class I soils, 25 percent is class II soils, 18 percent is class III soils, and 21 percent is class IV soils. The capability classification of each map unit is given in the section "Detailed soil map units."

rangeland

Peter W. Jensen, range conservationist, Soil Conservation Service, helped prepare this section.

Rangeland makes up approximately 13 percent of the total agricultural land in Butler County. It is scattered throughout the county with the greatest concentration in the Platte River broken land and the loess and glacial till areas in the southeastern part of the county. Rangeland is common in the Uly-Coly, Crofton-Monona, Ponca-Sharpsburg, and Sharpsburg-Steinauer-Pawnee soil associations.

The rangeland is mainly in Silty, Limy Upland, Subirrigated, and Clayey range sites. The rest is in Sandy Lowland, Saline Lowland, Saline Subirrigated, Silty Lowland, Clayey Overflow, Silty Overflow, Sandy, Sands, and Dense Clay range sites. On the average, livestock farms and ranches in Butler County are about 480 acres in size.

Livestock raising, mainly cow and calf herds, is the second largest agricultural industry in the county. The range generally is grazed from late in spring to early in fall, and the calves are sold in the fall as feeders. The cattle graze tame pasture of smooth brome in spring and corn or grain sorghum aftermath in fall and early in winter. They are fed alfalfa or native hay or silage, or both, for the rest of the winter.

A range site, determined by the kind and amount of vegetation on the soil when the site is in excellent range condition, is listed at the end of each map unit description. Interpretations for each range site in the county can be obtained from the local office of the Soil Conservation Service. Ranchers and livestock farmers who want technical assistance in reseeding cropland to grass or in setting up a planned grazing system can obtain help from the local office of the Soil Conservation Service.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 7 shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as or are suited to rangeland are listed. Explanation of the column headings in table 7 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range

plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre reduced to a common percent of air-dry moisture.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of undesirable brush species, conservation of water, and control of water erosion and soil blowing. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

woodland, windbreaks, and environmental plantings

Keith Ticknor, forester, Soil Conservation Service, helped prepare this section.

Natural woodland in Butler County is mainly limited to bottom lands in the Platte and Big Blue River Valleys and along the major tributaries. There are some small woodlots on rough or steep land, and many small drainageways are wooded. Some wooded areas are capable of producing lumber for commercial wood products, but most of them are unmanaged and are left intact for watershed protection or wildlife habitat or for esthetic reasons.

Eastern cottonwood, willow, American elm, and other trees that tolerate wetness grow on the bottom lands. Green ash, black walnut, boxelder, honeylocust, and silver maple are the dominant species in the wooded drainageways and on the lower part of slopes. Upland woodlots consist mainly of green ash, bur oak, black locust, Siberian elm, and a few other trees that do well on soil that is not subirrigated. Numerous species of trees are native to the county, but only a few are of value for commercial wood products. These are black walnut, eastern cottonwood, green ash, bur oak, and silver maple.

Many of the farmsteads in Butler County are sheltered by trees. Early settlers planted trees to provide shade in summer and to create a natural barrier that would protect their farmsteads, their livestock, and their crops against wind and snow. Through the years, landowners have planted trees to protect their property. Tree plantings are now designed for specific purposes, one of which is to protect the soil itself. Many older windbreaks were planted with Siberian elms and other short-lived trees that have matured and are now deteriorating. Replacing these trees can restore the effectiveness of the windbreak.

Selecting those trees and shrubs that are adapted to the soil or soils in the site to be planted is the first step toward ensuring survival. Preparing the site properly before planting and controlling weeds after planting are the major concerns in establishing and managing a windbreak.

The conifers, redcedar, pine, and spruce, are well suited to use in windbreaks. They retain their leaves through the winter, giving shelter when it is most needed, and they make good barriers to hold snow.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and tall-growing broadleaf and coniferous trees and shrubs provide the most protection (fig. 15).

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Figure 15.—Young trees in farmstead windbreak on Gibbon silty clay loam, 0 to 2 percent slopes.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

Robert D. Koerner, biologist, Soil Conservation Service, helped prepare this section.

Many areas in Butler County provide sites for hunting and fishing. In some areas, ponds in worked-out and abandoned gravel pits have been developed for recreation use. Some of these ponds are used for boating and swimming, and others, where trees and plant cover have been reestablished, are used for fishing and duck hunting.

Skull Creek special use area, which is managed by the Nebraska Game and Parks Commission, is used for hiking.

Most of the towns in Butler County have municipal parks for picnicking. David City also has facilities for camping and swimming and a 33-acre, 9-hole municipal golf course.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also

important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and grain sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, orchardgrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil

properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are big and little bluestem, goldenrod, giant ragweed, western wheatgrass, and sideoats grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are bur oak, green ash, hackberry, apple, Washington hawthorn, Russian mulberry, and honeylocust. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Peking cotoneaster, common lilac, and native plum.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are Scotch, Austrian, and ponderosa pine and redcedar.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are native plum, Peking cotoneaster, common lilac, and Amur honeysuckle.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, prairie cordgrass, rushes, sedges, and reedgrasses.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, ring-necked pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include thrushes, woodpeckers, squirrels, red fox, skunk, raccoon, deer, and coyote.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, white-tailed deer, prairie grouse, meadowlark, and lark bunting.

The thirteen soil associations in Butler County are discussed in relation to wildlife in the following paragraphs.

The Alda-Boel-Barney association provides habitat for woodland and wetland wildlife. White-tailed deer, cottontail rabbits, tree squirrels, and songbirds inhabit the wooded areas near the Platte River. Muskrat, mink, shore birds, and waterfowl inhabit areas of low, wet soils close by the river.

The Brocksburg-Simeon-Thurman association is a wide, relatively flat terrace. The vegetation is mostly short native grasses, except in some irrigated areas that are planted to corn. Along road ditches, plum thickets provide cover for pheasants and bobwhite quail.

Crops grown in the Gibbon-Muir-Zook association are mainly corn, wheat, grain sorghum, and alfalfa. Some wet areas are planted to reed canarygrass for hay and pasture. Shore birds and waterfowl frequent these areas. Pheasants and bobwhite quail also are inhabitants.

The Muir-Grigston-Cozad association is suited to openland wildlife. Most of the acreage is used as cropland; corn is the major crop. This association extends east and west across the entire county. It provides food for white-tailed deer and other animals that are passing back and forth between the Platte River and the upland breaks.

The Uly-Coly association and the Crofton-Monona association are on sloping to very steep breaks and in drainageways. There are thickets and groves of bur oak, redcedar, boxelder, and mulberry. Most of the acreage is in rangeland or pasture. Native grasses include big bluestem, little bluestem, indiangrass, sideoats grama, and blue grama. The areas provide excellent habitat for white-tailed deer, fox, coyote, tree squirrels, songbirds, pheasant, and bobwhite quail.

The Hastings-Butler association and the Butler-Hastings association include some depressional areas that are wet in the spring. Migrating waterfowl use these areas in some years. Scattered trees along fences, field windbreaks, and farmstead shelterbelts provide winter cover for squirrels, rabbits, songbirds, and upland game birds.

The Ponca-Sharpsburg association, the Sharpsburg-Steinauer-Pawnee association, and the Sharpsburg association provide primarily openland habitat. Many birds and animals, including pheasant, bobwhite quail, cottontail rabbits, jackrabbits, white-tailed deer, squirrel, fox, coyote, songbirds, rodents, hawks, owls, eagles,

skunk, badger, and opossum, inhabit areas of these associations. The landscape is nearly level to steep, and woody plants grow along the drainages. There is a great diversity of cover types in these associations, providing an ideal environment for wildlife.

The Hall-Muir-Hobbs association and the Hobbs-Kezan-Muir ssociation provide excellent habitat for wildlife along the major drainages. Woody plants, for example, green ash, native plum, redcedar, Russian-olive, chokecherry, mulberry, hackberry, and honeysuckle, grow along the streams. The diverse cover types include native rangeland and pastureland as well as cropland. White-tailed deer, cottontail rabbits, jackrabbits, squirrel, pheasant, bobwhite quail, and songbirds are the common kinds of wildlife.

Mourning doves are common throughout the county and frequent the areas of all the soil associations.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed

soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is

placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil for a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches

of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large

stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind

erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on

the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

engineering index test data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and their morphology." The soil samples were tested by the Nebraska Department of Roads.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); and Specific gravity—T 100-75 (AASHTO). The group index number that is a part of the AASHTO classification is computed using the Nebraska modified system.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*8*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol.* An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning intermittent dryness, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Argiustolls (*Argi*, meaning argillic or clayey horizonation, plus *ustoll*, the suborder of the Mollisols that have an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Udic* identifies the subgroup that receives more precipitation than is typical of the great group. An example is Udic Argiustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Udic Argiustolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*6*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*8*). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Alda series

The Alda series consists of somewhat poorly drained soils on bottom lands along the Platte River. Alda soils are moderately deep over coarse sand and gravel. Permeability is moderately rapid in the solum and very rapid in the underlying sand. Slope ranges from 0 to 2 percent.

Alda soils commonly are adjacent to Barney, Boel, and Inavale soils. Boel soils have sand at a depth of less than 20 inches. They are at a slightly lower elevation than Alda soils. Barney and Inavale soils do not have a mollic epipedon. Barney soils are at a lower elevation

than Alda soils, and Inavale soils are somewhat excessively drained and are in higher positions on the landscape.

Typical pedon of Alda fine sandy loam, in an area of Boel-Alda complex, 0 to 2 percent slopes, 1,690 feet north and 50 feet east of the southwest corner of sec. 13, T. 17 N., R. 4 E.

A11—0 to 10 inches; dark gray (10YR 4/1) fine sandy loam, very dark gray (10YR 3/2) moist; weak coarse subangular blocky structure; soft, friable; mildly alkaline; clear smooth boundary.

A12—10 to 14 inches; gray (10YR 5/1) fine sandy loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure; soft, very friable; mildly alkaline; slight effervescence; clear smooth boundary.

C1—14 to 19 inches; light gray (10YR 7/2) fine sandy loam, grayish brown (10YR 5/2) moist; few medium prominent strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; loose; moderately alkaline; slight effervescence; clear smooth boundary.

C2—19 to 21 inches; mixed light brownish gray (10YR 6/2) and light gray (10YR 7/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; few fine prominent brown (7.5YR 5/6) mottles; single grain; loose; moderately alkaline; slight effervescence; clear smooth boundary.

C3—21 to 26 inches; light gray (10YR 7/2) fine sandy loam, grayish brown (10YR 5/2) moist; many coarse prominent strong brown (7.5YR 5/6) mottles; single grain; loose; mildly alkaline; clear smooth boundary.

IIC—26 to 60 inches; light gray (10YR 7/2) coarse sand with about 2 to 5 percent gravel, light brownish gray (10YR 6/2) moist; many coarse prominent strong brown (7.5YR 5/6) mottles; single grain; loose; mildly alkaline.

The mollic epipedon is 10 to 20 inches thick. Coarse sand and gravel are at a depth of 20 to 40 inches.

The A horizon has value of 4 or 5 (2 or 3 moist). It is typically fine sandy loam, but the range includes loam and very fine sandy loam. In some pedons there is an AC horizon. The C horizon has value of 6 or 7 (4 or 5 moist). It commonly has few to many mottles. In some pedons, it has thin strata of finer or coarser textured material. The IIC horizon typically is sand, but it ranges from fine sand to coarse sand. In some pedons, this horizon is up to 15 percent gravel, by volume.

Barney series

The Barney series consists of poorly drained, frequently flooded soils on bottom lands of the Platte River. Barney soils are shallow over fine sand. They formed in alluvium. Permeability is moderately rapid in the solum and very rapid in the underlying sand. Slope ranges from 0 to 2 percent.

Barney soils commonly are adjacent to Alda, Boel, and Inavale soils. Alda soils have a mollic epipedon and are over 20 inches deep to sand. Boel soils are slightly deeper to sand than Barney soils and are somewhat poorly drained. Inavale soils are somewhat excessively drained and are in a higher position on the landscape.

Typical pedon of Barney loam, 0 to 2 percent slopes, 200 feet west of the northeast corner of sec. 14, T. 17 N., R. 4 E.

A1—0 to 7 inches; grayish brown (10YR 5/2) loam, dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable; strong effervescence; mildly alkaline; abrupt smooth boundary.

IIC1—7 to 14 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; few thin strata of loam; few fine faint yellowish brown (10YR 5/4) mottles; single grain; loose; some material of the A1 horizon mixed in channels; neutral; gradual wavy boundary.

IIC2—14 to 60 inches; stratified light gray (10YR 7/2) and gray (10YR 5/1) fine sand, grayish brown (10YR 5/2) moist; common medium prominent dark brown (10YR 4/3) mottles; single grain; loose; neutral.

The solum and the mollic epipedon are 7 to 10 inches thick.

The A horizon has value of 3 through 5 (2 or 3 moist) and chroma of 1 or 2. Thin strata of lighter colored material are in some pedons. The A horizon is dominantly loam but ranges from silty clay loam to loamy fine sand. Some pedons have a thin AC horizon. The IIC horizon has value of 5 through 7 (4 or 5 moist) and chroma of 1 or 2. It has few to many mottles. The texture ranges from fine sand to coarse sand. This horizon is up to 15 percent gravel, by volume. In most pedons, thin strata of finer and coarser textured material are common.

Blendon series

The Blendon series consists of deep, well drained soils on terraces of the Platte River. These soils formed in loamy alluvial material. Permeability is moderately rapid in the solum and rapid in the underlying loamy sand. Slope ranges from 0 to 6 percent.

Blendon soils are similar to Thurman soils and commonly are adjacent on the landscape to Alda, Gibbon, Muir, and Zook soils. Thurman soils have a mollic epipedon that is less than 20 inches thick and are coarser textured than Blendon soils. Alda soils are shallower to sand and are somewhat poorly drained. Gibbon soils are somewhat poorly drained. Muir soils are silty throughout the profile. Zook soils have a fine textured control section and are poorly drained.

Typical pedon of Blendon fine sandy loam, in an area of Blendon-Muir complex, 0 to 2 percent slopes, 500 feet north and 25 feet east of the center of section 2, T. 16 N., R. 3 E.

Ap—0 to 7 inches; dark gray (10YR 4/1) fine sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, friable; neutral; abrupt smooth boundary.
A12—7 to 15 inches; dark grayish brown (10YR 4/2) fine sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, friable; neutral; clear smooth boundary.
B21—15 to 21 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure; soft, friable; neutral; clear smooth boundary.
B22—21 to 32 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure; soft, friable; neutral; clear smooth boundary.
B3—32 to 44 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; soft, very friable; neutral; clear smooth boundary.
C2—44 to 60 inches; light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4) moist; single grain; loose moist and dry; neutral.

The solum is 30 to 45 inches thick. The mollic epipedon is 20 to 45 inches thick.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is typically fine sandy loam, but the range includes loam. The A horizon is slightly acid or neutral. The B horizon has value of 3 or 5 (2 or 3 moist) and chroma of 1 through 3. It is fine sandy loam or sandy loam. The B horizon is neutral or slightly acid. The C horizon has value of 5 through 7 (4 or 5 moist) and chroma of 2 through 4. It is loamy sand or, in places, fine sand.

Boel series

The Boel series consists of deep, somewhat poorly drained, rapidly permeable soils on bottom lands of the Platte River. These soils formed in alluvium. Slope ranges from 0 to 2 percent.

Boel soils are similar to Alda soils and commonly are adjacent to Alda, Barney, and Inavale soils. Alda soils have sand at a depth of more than 20 inches and are at a slightly higher elevation than Boel soils. Barney soils are poorly drained and shallower to sand. Inavale soils are somewhat excessively drained and are in higher positions on the landscape.

Typical pedon of Boel loam, in an area of Boel-Alda complex, 0 to 2 percent slopes, 1,490 feet south and 70 feet west of the northeast corner of section 14, T. 17 N., R. 4 E.

Ap—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak coarse subangular blocky structure parting to weak fine granular; soft, friable; violent effervescence; moderately alkaline; abrupt smooth boundary.
AC—8 to 17 inches; mixed 70 percent gray (10YR 5/1) and 30 percent light brownish gray (10YR 6/2) loam; very dark grayish brown (10YR 3/2) and black (10YR 2/1) moist loam in old root channels; weak coarse subangular blocky structure parting to weak fine granular; soft, friable; strong effervescence; moderately alkaline; abrupt smooth boundary.
IIC1—17 to 36 inches; light gray (10YR 7/2) sand, grayish brown (10YR 5/2) moist; common coarse prominent strong brown (7.5YR 5/6) mottles; single grain; loose; moderately alkaline; abrupt smooth boundary.
C2—36 to 45 inches; light gray (10YR 7/2) coarse sand, grayish brown (10YR 5/2) moist; common coarse prominent strong brown (7.5YR 5/6 moist) mottles; single grain; moderately alkaline; abrupt smooth boundary.
IIC3—45 to 55 inches; light gray (10YR 7/2) fine sand, grayish brown (2.5Y 5/2) moist; common coarse prominent strong brown (7.5YR 5/6) mottles; single grain; moderately alkaline; abrupt smooth boundary.
IIC4—55 to 60 inches; light gray (10YR 7/2) coarse sand, grayish brown (2.5Y 5/2) moist; common coarse prominent strong brown mottles; single grain; loose; moderately alkaline.

The solum and the mollic epipedon, in most places, are 10 to 20 inches thick.

The A horizon has value of 3 through 5 (2 or 3 moist) and chroma of 1 or 2. It is typically loam, but the range includes fine sandy loam and loamy fine sand. The IIC horizon has value of 6 or 7 moist. It has few to many mottles. The texture ranges from fine sand to coarse sand. This horizon is up to 15 percent gravel, by volume.

Brocksburg series

The Brocksburg series consists of well drained soils that are moderately deep over sand. The soils formed in loamy material overlying sand on terraces of the Platte River. Permeability is moderate in the B horizon and very rapid in the underlying sand. Slope ranges from 0 to 2 percent.

Brocksburg soils commonly are adjacent to Muir, Ovina, and Thurman soils. Muir soils have a mollic epipedon that is more than 20 inches thick. Ovina soils are somewhat poorly drained. Thurman soils are sandy throughout, and the underlying sand is not so coarse as that underlying Brocksburg soils.

Typical pedon of Brocksburg sandy loam, 0 to 2 percent slopes, 1,340 feet north and 75 feet west of the southeast corner, sec. 20, T. 16 N., R. 1 E.

Ap—0 to 7 inches; dark gray (10YR 4/1) sandy loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable; medium acid; abrupt smooth boundary.
A12—7 to 12 inches; dark gray (10YR 4/1) sandy loam, very dark gray (10YR 3/1) moist; weak fine granular

structure; soft, very friable; medium acid; clear smooth boundary.

A13—12 to 19 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak coarse subangular structure; slightly hard, friable; slightly acid; clear smooth boundary.

B1—19 to 28 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; soft, friable; slightly acid; clear smooth boundary.

B21t—28 to 34 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable; slightly acid; clear smooth boundary.

B22t—34 to 40 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable; slightly acid; abrupt smooth boundary.

IIC1—40 to 50 inches; yellowish brown (10YR 5/4) sand, brown (10YR 5/3) moist; single grain; loose; slightly acid; gradual smooth boundary.

IIC2—50 to 60 inches; light yellowish brown (10YR 6/4) sand, brown (10YR 5/3) moist; single grain; loose; slightly acid.

The solum is 20 to 46 inches thick. The mollic epipedon is 20 to 32 inches thick. The depth to sand ranges from 32 to 40 inches.

The A horizon has value of 3 through 5 (2 or 3 moist) and chroma of 1 or 2. It is typically sandy loam, but the range includes loamy sand, fine sandy loam, and loam. In some pedons, there is a loam B1 horizon. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 3 or 4. It is clay loam, silty clay loam, or loam. The IIC horizon has value of 5 through 7 (4 through 6 moist). It is up to 15 percent gravel, by volume. The sand is mainly medium and coarse.

Burchard series

The Burchard series consists of deep, well drained, moderately slowly permeable soils on uplands. These soils formed in moderately fine textured, calcareous glacial till. Slope ranges from 6 to 15 percent.

Burchard soils commonly are adjacent on the landscape to Pawnee, Ponca, Sharpsburg, and Steinauer soils. Pawnee soils have a finer textured B2t horizon and are at a slightly higher elevation than Burchard soils. Ponca soils do not have an argillic horizon. Sharpsburg soils formed in loess, are deeper to lime, and are in higher positions on the landscape. Steinauer soils do not have a mollic epipedon.

Typical pedon of Burchard loam, 11 to 15 percent slopes, 1,400 feet south and 70 feet east of the northwest corner of sec. 26, T. 14 N., R. 4 E.

A1—0 to 12 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium granular structure; soft, friable; few small pebbles and stones; slightly acid; gradual wavy boundary.

B21t—12 to 17 inches; mixed dark grayish brown (10YR 4/2) and brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, friable; clay coatings on peds; few small pebbles and stones; slightly acid; clear wavy boundary.

B22t—17 to 25 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable; clay coatings on peds; few small pebbles and stones; slightly acid; gradual wavy boundary.

B3—25 to 32 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, friable; few medium lime segregations; few small pebbles and stones; neutral; strong effervescence in seams; clear wavy boundary.

C—32 to 60 inches; mixed light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) clay loam, mixed light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) moist; many coarse prominent brownish yellow (10YR 6/6) mottles; moderate medium and coarse blocky structure; hard, firm; many coarse lime segregations; few small pebbles and stones; violent effervescence; mildly alkaline.

The solum is 24 to 40 inches thick. Depth to carbonates ranges from 13 to 30 inches. The mollic epipedon is 7 to 18 inches thick.

The A horizon has value of 3 through 5 (2 or 3 moist) and chroma of 1 or 2. The B horizon has value of 4 to 6 (3 through 5 moist) and chroma of 2 through 5. It is 25 to 35 percent clay. The C horizon has value of 6 or 7 and chroma of 2.

Butler series

The Butler series consists of deep, somewhat poorly drained, slowly permeable soils on flat uplands and terraces. These soils formed in silty loess and have a dense claypan subsoil. Slope ranges from 0 to 1 percent.

Butler soils commonly are adjacent to Fillmore and Hastings soils. Fillmore soils have an albic horizon and are more poorly drained and in lower positions on the landscape than Butler soils. Hastings soils are better drained, have less clay in the Bt horizon, and are in higher positions than Butler soils.

Typical pedon of Butler silt loam, 0 to 1 percent slopes, 1,380 feet south and 60 feet west of the northeast corner of sec. 20, T. 15 N., R. 3 E.

Ap—0 to 7 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak medium

subangular blocky structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A12—7 to 14 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

B21t—14 to 24 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; strong medium blocky structure; hard, very firm; dark coatings on faces of peds; neutral; gradual smooth boundary.

B22t—24 to 35 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; few fine distinct yellowish brown (10YR 5/4) mottles; strong medium prismatic structure parting to strong medium blocky; hard, very firm; neutral; clear smooth boundary.

B3—35 to 40 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; slightly hard, friable; dark coatings along cracks and faces of peds; neutral; clear smooth boundary.

C1—40 to 56 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; many coarse prominent strong brown (7.5YR 5/6) mottles; massive; hard, friable; few coarse prominent black ferromanganese segregations; neutral; clear smooth boundary.

C2—56 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; many coarse prominent strong brown (7.5YR 5/6) mottles; massive; hard, friable; violent effervescence; mildly alkaline.

The solum is 26 to 48 inches thick. Depth to free carbonates is 36 to 60 inches. The mollic epipedon is 20 to 40 inches thick.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. In some pedons, there is a thin A2 horizon. The A horizon is medium acid or slightly acid. The B2t horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is 45 to 55 percent clay. It ranges from slightly acid to mildly alkaline. The C horizon has few to many mottles.

Coly series

The Coly series consists of deep, somewhat excessively drained and excessively drained, moderately permeable soils on uplands (fig. 16). These soils formed in silty, calcareous loess. Slope ranges from 11 to 60 percent, and the slopes generally are convex.

Coly soils are similar to Crofton soils and commonly are adjacent to Cozad, Holder, and Uly soils. Crofton soils have more carbonate concretions in the solum than Coly soils. Unlike Coly soils, Cozad, Holder, and Uly soils have a mollic epipedon and a B horizon, and they do not have carbonates in the upper part of the profile.

Figure 16.—Profile of Coly silt loam, a deep soil that is calcareous at or near the surface. Depth is marked in feet.

Typical pedon of Coly silt loam, 30 to 60 percent slopes, 570 feet east and 270 feet south of the northwest corner of sec. 5, T. 15 N., R. 1 E.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable; mildly alkaline; clear smooth boundary.

AC—5 to 9 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, friable; mildly alkaline; slight effervescence; clear smooth boundary.

C1—9 to 19 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, friable; few fine lime accumulations; mildly alkaline; violent effervescence; clear smooth boundary.

C2—19 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; few fine prominent strong brown (7.5YR 5/6) mottles; massive; soft, very friable; common fine lime accumulations; few fine manganese segregations; mildly alkaline; violent effervescence.

The solum is 5 to 14 inches thick. Depth to carbonates ranges from 0 to 10 inches. The A horizon is 4 to 7 inches thick.

The A horizon has value of 4 through 7 (3 through 5 moist) and chroma of 2 or 3. The AC horizon is 4 to 10 inches thick. In some places there is no AC horizon. The C horizon has hue of 10YR or 2.5Y, value of 6 or 7 (5 or 6 moist), and chroma of 2 or 3.

Cozad series

The Cozad series consists of deep, well drained, moderately permeable soils on rarely flooded stream terraces and foot slopes. These soils formed in silty loess and colluvium. Slope ranges from 1 to 3 percent.

Cozad soils are similar to Muir soils and commonly are adjacent on the landscape to Coly, Hobbs, Thurman, and Uly soils. Muir soils have a mollic epipedon that is more than 20 inches thick. Coly soils do not have a mollic epipedon and are on steeper slopes on uplands. Hobbs soils are stratified and are at a lower elevation than Cozad soils. Thurman soils are sandy throughout the profile. Uly soils have a thinner mollic epipedon and are shallower to lime.

Typical pedon of Cozad silt loam, 1 to 3 percent slopes, 1,300 feet north and 50 feet west of the southeast corner of sec. 22, T. 16 N., R. 2 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak very fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

A12—7 to 12 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable; many wormcasts; neutral; clear smooth boundary.

B1—12 to 16 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable; many wormcasts; neutral; clear smooth boundary.

B2—16 to 29 inches; pale brown (10YR 6/3) silt loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable; few wormcasts; neutral; clear smooth boundary.

C1—29 to 40 inches; pale brown (10YR 6/3) very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; soft, friable; neutral; abrupt smooth boundary.

C2—40 to 60 inches; very pale brown (10YR 7/3) very fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; few fine lime concretions; neutral; slight effervescence.

The solum is 15 to 30 inches thick. Depth to carbonates ranges from 30 to 50 inches. The mollic epipedon is 10 to 16 inches thick.

The A horizon has value of 3 or 4 (2 or 3 moist). It is dominantly silt loam, but the range includes loam. The B horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. The darker colors are in the upper part of the B horizon. The C horizon has value of 6 or 7 (4 or 5 moist) and chroma of 2 or 3. It is silt loam or very fine sandy loam.

Crofton series

The Crofton series consists of deep, well drained to excessively drained, moderately permeable soils on uplands (fig. 17). These soils formed in silty, calcareous loess. Slope ranges from 6 to 60 percent, and the slopes generally are convex.

Crofton soils are similar to Coly soils and commonly are adjacent to Monona and Ponca soils. Coly soils have fewer carbonate concretions in the profile. Monona soils have a B horizon and do not have carbonates in the upper part of the profile. Ponca soils have a B horizon and are finer textured in the upper part of the profile than Crofton soils.

Typical pedon of Crofton silt loam, 6 to 11 percent slopes, eroded, 2,340 feet east and 455 feet north of the southwest corner of sec. 2, T. 16 N., R. 4 E.

Ap—0 to 6 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak very fine granular structure; soft, very friable; moderately alkaline; violent effervescence; abrupt smooth boundary.

AC—6 to 13 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; few fine prominent strong brown (7.5YR 5/8) relict mottles; weak coarse subangular blocky structure; soft, very friable; many medium lime concretions; moderately

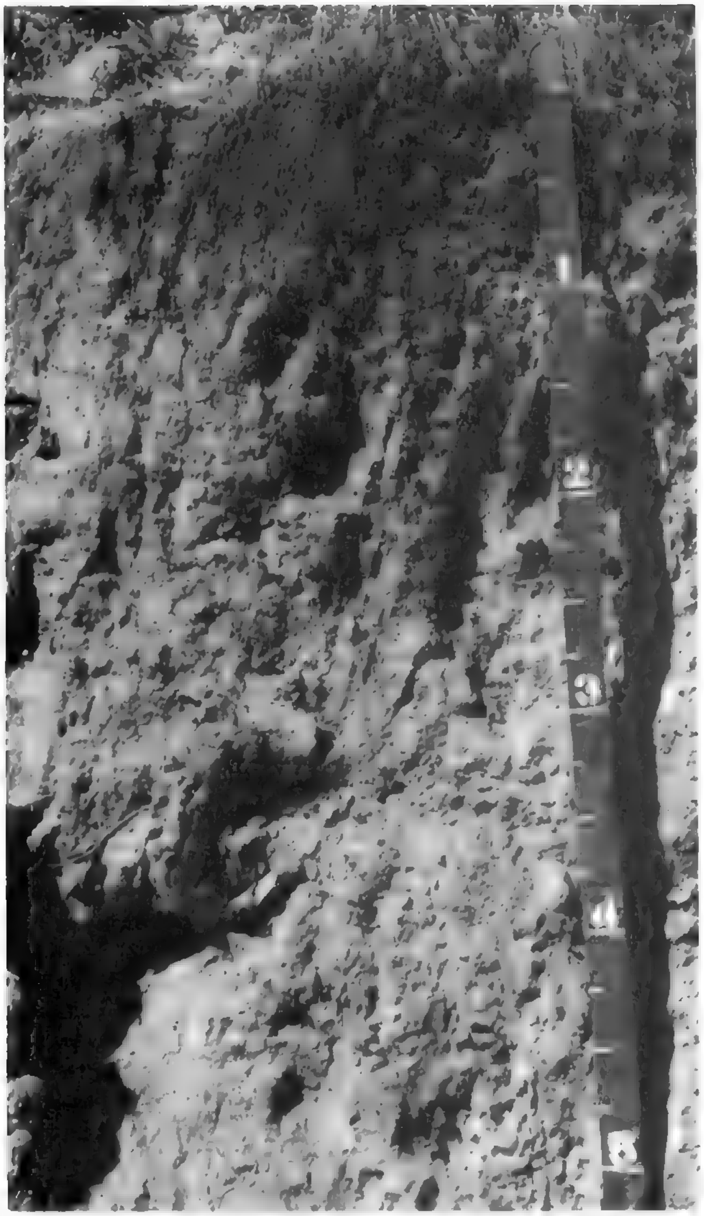

Figure 17.—Profile of Crofton silt loam, a deep soil that is calcareous at or near the surface. Depth is marked in feet.

alkaline; violent effervescence; clear smooth boundary.

C1—13 to 25 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; few fine prominent strong brown (7.5YR 5/6) relict mottles; massive; soft, very friable; many fine lime accumulations; moderately alkaline; violent effervescence; gradual wavy boundary.

C2—25 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; common medium prominent strong brown (7.5YR 5/6) relict mottles; massive; soft, very friable; many fine lime accumulations; moderately alkaline; strong effervescence.

The solum is 6 to 15 inches thick. Depth to carbonates ranges from 0 to 8 inches.

The A horizon has value of 4 through 6 (3 or 4 moist) and chroma of 2 or 3. The AC horizon typically is 4 to 9 inches thick. In some places, there is no AC horizon. The C horizon has hue of 10YR or 2.5Y, value of 6 or 7 (5 or 6 moist), and chroma of 2 through 4.

Fillmore series

The Fillmore series consists of deep, poorly drained soils in shallow depressions on uplands. Permeability is very slow. The soils formed in silty loess. Slope ranges from 0 to 1 percent.

Fillmore soils are similar to Scott soils and commonly are adjacent to Butler and Hastings soils. Scott soils are very poorly drained and have a thinner A1 horizon than Fillmore soils have. Butler and Hastings soils are better drained than Fillmore soils and do not have an A2 horizon. Hastings soils have higher chroma and have less clay in the argillic horizon.

Typical pedon of Fillmore silt loam, 0 to 1 percent slopes, 475 feet west and 75 feet north of the southeast corner of the southwest quarter of sec. 36, T. 14 N., R. 1 E.

Ap—0 to 7 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak very fine granular structure; soft, very friable; medium acid; abrupt smooth boundary.

A2—7 to 12 inches; gray (10YR 6/1) silt loam, gray (10YR 5/1) moist; common coarse prominent reddish brown (5YR 4/4) mottles; weak fine platy structure; soft, very friable; medium acid; abrupt smooth boundary.

B21t—12 to 22 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; strong coarse and medium blocky structure; very hard, very firm; shiny faces on most peds; neutral; gradual wavy boundary.

B22t—22 to 34 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; strong coarse and medium blocky structure; very hard, very firm; neutral; gradual wavy boundary.

B3—34 to 47 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; few fine prominent brown (7.5YR 5/4) mottles; moderate medium blocky structure; hard, firm; few fine prominent ferromanganese pellets; neutral; clear wavy boundary.

C—47 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; common

medium prominent reddish brown (5YR 4/4) mottles; massive; slightly hard, friable; common fine prominent ferromanganese pellets; neutral.

The solum is 36 to 54 inches thick. In a few places, free carbonates are at a depth of 48 inches, but in most places, they are below a depth of 60 inches.

The Ap horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The A2 horizon has value of 5 through 7 (4 to 5 moist) and chroma of 1. It is 3 to 10 inches thick. The B2 horizon has value of 3 through 5 (2 or 3 moist) and chroma of 1 or 2. It is silty clay. The clay content averages 45 to 55 percent. The C horizon has value of 5 through 7 (5 or 6 moist) and chroma of 2 or 3. In most places, there are mottles in the lower part of the profile.

Gibbon series

The Gibbon series consists of deep, somewhat poorly drained, moderately permeable soils on bottom lands of the Platte River. These soils formed in silty and loamy, calcareous alluvial material. Slope ranges from 0 to 2 percent.

Gibbon soils are similar to Lamo soils and commonly are adjacent to Blendon, Boel, Cozad, and Zook soils. Lamo soils have a mollic epipedon that is more than 20 inches thick. Blendon and Boel soils have a sandy A horizon and are at a slightly higher elevation. Cozad soils are coarse-silty, are in a higher position on the landscape, and have a B horizon. Zook soils have a fine textured control section.

Typical pedon of Gibbon silty clay loam, 0 to 2 percent slopes, 835 feet south and 80 feet east of the northwest corner of sec. 13, T. 16 N., R. 2 E.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak very fine granular structure; slightly hard, friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

A12—7 to 14 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, friable; moderately alkaline; violent effervescence; clear smooth boundary.

AC—14 to 19 inches; gray (10YR 5/1) clay loam, dark gray (2.5Y 4/1) moist; moderate medium and fine subangular blocky structure; hard, friable; few lime threads; moderately alkaline; violent effervescence; clear smooth boundary.

C1—19 to 26 inches; gray (10YR 6/1) clay loam, gray (10YR 5/1) moist; few fine distinct dark brown (7.5YR 4/2) mottles; weak medium subangular blocky structure; slightly hard, friable; organic stains; few fine lime segregations; moderately alkaline; violent effervescence; clear smooth boundary.

C2—26 to 36 inches; light gray (10YR 7/1) clay loam, light brownish gray (2.5Y 6/2) moist; few fine prominent dark brown (7.5YR 4/2) mottles; weak medium subangular blocky structure; soft, friable; many fine lime segregations; moderately alkaline; violent effervescence; clear smooth boundary.

C3—36 to 48 inches; light gray (10YR 7/1) sandy loam, light brownish gray (2.5Y 6/2) moist; massive; slightly hard, friable; strongly alkaline; violent effervescence; abrupt smooth boundary.

C4—48 to 60 inches; light gray (10YR 7/1) loamy sand, light brownish gray (2.5Y 6/2) moist; few medium prominent dark brown (7.5YR 4/2) mottles; single grain; slightly hard, very friable; strongly alkaline; violent effervescence.

The solum is 15 to 28 inches thick. The mollic epipedon is 7 to 20 inches thick.

The A horizon has value of 3 through 5 (2 or 3 moist) and chroma of 1 or 2. It is mildly alkaline or moderately alkaline. The C horizon has hue of 10YR and 2.5Y, value of 5 through 7 (4 through 6 moist), and chroma of 1 or 2. It is dominantly silty clay loam, but the range includes clay loam. Below a depth of 40 inches, the C horizon is commonly sandier and lighter in color. It is moderately or strongly alkaline.

Grigston series

The Grigston series consists of deep, well drained, moderately permeable soils on rarely flooded high bottom lands. These soils formed in stratified, silty alluvial material. Slope ranges from 0 to 1 percent.

Grigston soils are similar to Hobbs and Muir soils and commonly are adjacent to Boel, Cozad, Gibbon, and Zook soils. Hobbs soils do not have a mollic epipedon and are in upland drainageways. Muir soils have a mollic epipedon that is more than 20 inches thick. Boel soils have a sandy A horizon. Cozad soils have a B horizon and are at a slightly higher elevation. Gibbon soils are somewhat poorly drained and have a silty clay loam A horizon. Zook soils are poorly drained and have a fine textured solum.

Typical pedon of Grigston silt loam, 0 to 1 percent slopes, 660 feet east and 55 feet south of the northwest corner, sec. 18, T. 16 N., R. 4 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak very fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A12—8 to 19 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak very fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

C—19 to 36 inches; mixed dark grayish brown (10YR 4/2) and light gray (10YR 7/2) silt loam, mixed very dark gray (10YR 3/1) and pale brown (10YR 6/3) moist; weak coarse subangular blocky structure; slightly hard, friable; neutral; abrupt smooth boundary.

Ab1—36 to 55 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure parting to weak very fine granular; slightly hard, friable; neutral; clear smooth boundary.

Ab2—55 to 60 inches; dark grayish brown (10YR 4/2) heavy silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine granular; slightly hard, friable; neutral.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The mollic epipedon is 10 to 20 inches thick. The C horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 through 3. It has thin strata that have a higher value. Ab horizons are common at a depth of 30 to 48 inches. They have value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. These buried horizons are neutral or mildly alkaline.

Hall series

The Hall series consists of deep, well drained, moderately permeable soils on stream terraces. These soils formed in silty alluvium. Slope ranges from 0 to 1 percent.

Hall soils are similar to Muir soils and commonly are adjacent to Butler, Hastings, and Hobbs soils. Unlike Hall soils, Muir soils do not have an argillic horizon. Butler and Hastings soils have a fine textured B2t horizon and have a mollic epipedon that is less than 20 inches thick. Hobbs soils do not have an argillic horizon.

Typical pedon of Hall silt loam, 0 to 1 percent slopes, 60 feet north and 60 feet east of the center of sec. 14, T. 13 N., R. 1 E.

Ap—0 to 7 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A12—7 to 13 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

A13—13 to 18 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable; neutral; dark material in worm channels; clear smooth boundary.

B21t—18 to 32 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable; neutral; clear smooth boundary.

B3—32 to 39 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

C—39 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable; neutral.

The solum is 30 to 48 inches thick. The mollic epipedon is 20 to 32 inches thick.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The B2t horizon has value of 3 through 5 (3 or 4 moist) and chroma of 1 or 2. It is silty clay loam. It is 30 to 35 percent clay. The B3 horizon, if present, is silty clay loam or silt loam. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 or 3.

Hastings series

The Hastings series consists of deep, well drained soils (fig. 18) on uplands. These soils formed in loess. Permeability is moderately slow. Slope ranges from 0 to 11 percent.

Hastings soils are similar to Sharpsburg soils and commonly are adjacent on the landscape to Butler and Fillmore soils. Sharpsburg soils are in the more humid eastern part of the county and have more clay in the surface layer than Hastings soils. Butler soils have lower chroma and more clay in the B horizon. Fillmore soils are more poorly drained, and they have an albic horizon.

Typical pedon of Hastings silt loam, 0 to 1 percent slopes, 1,320 feet south and 100 feet west of the northeast corner of sec. 9, T. 13 N., R. 1 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A12—7 to 10 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; clear smooth boundary.

B21t—10 to 16 inches; dark grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, firm; neutral; clear smooth boundary.

B22t—16 to 28 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, firm; coatings on ped faces; neutral; clear smooth boundary.

B3—28 to 40 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable; neutral; gradual smooth boundary.

C1—40 to 48 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; common medium prominent red (2.5YR 5/6) mottles; weak coarse subangular blocky structure; slightly hard, friable; few fine manganese segregations; neutral; gradual smooth boundary.

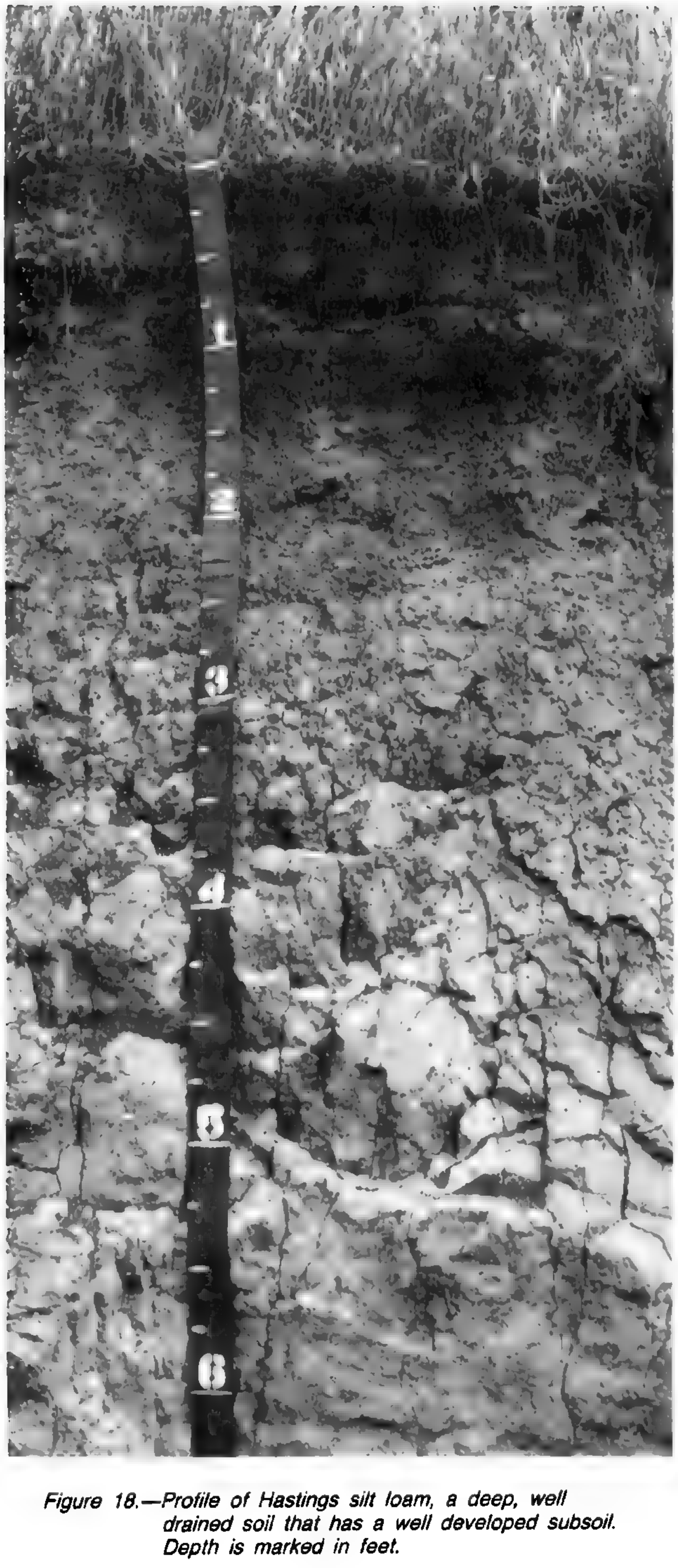

Figure 18.—Profile of Hastings silt loam, a deep, well drained soil that has a well developed subsoil. Depth is marked in feet.

C2—48 to 60 inches; very pale brown (10YR 7/4) silt loam, light yellowish brown (10YR 6/4) moist; common medium prominent red (2.5YR 5/6) mottles; massive; slightly hard, friable; neutral.

The solum is 36 to 52 inches thick. The mollic epipedon is 12 to 20 inches thick. Depth to free carbonates ranges from 48 to over 60 inches.

The A horizon has value of 3 through 5 (2 or 3 moist) and chroma of 1 or 2. It is dominantly silt loam, but the range includes silty clay loam. The B2t horizon has value of 4 to 6 (4 or 5 moist) and chroma of 2 or 3. It is silty clay loam or silty clay. This horizon, on the average, is about 38 percent clay, but the range is 35 to 42 percent. The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 through 6 moist), and chroma of 2 through 4. It is silt loam or silty clay loam.

The Hastings soils making up map units HdC2 and HdD2 have a thinner surface layer than is prescribed for the series, but this difference does not affect the use or behavior of these soils.

Hobbs series

The Hobbs series consists of deep, well drained, moderately permeable soils on occasionally flooded bottom lands (fig. 19). These soils formed in stratified, silty alluvial material. Slope ranges from 0 to 3 percent.

Hobbs soils are similar to Grigston and Muir soils and commonly are adjacent to Hastings, Monona, Ponca, Sharpsburg, and Uly soils on uplands. Grigston soils have a mollic epipedon. All the other soils have both a mollic epipedon and a B horizon, which Hobbs soils do not have.

Typical pedon of Hobbs silt loam, 0 to 1 percent slopes, 2,500 feet east and 50 feet south of the northwest corner of sec. 10, T. 16 N., R. 4 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

C1—7 to 16 inches; stratified grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; neutral; gradual wavy boundary.

C2—16 to 25 inches; stratified grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) moist; thin strata of dark grayish brown (10YR 4/2) silt loam; massive, parts to weak thin plates; slightly hard, very friable; neutral; gradual wavy boundary.

C3—25 to 27 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; many coarse prominent reddish brown (5YR 4/4, moist) mottles; massive, parts to weak thin plates;

slightly hard, very friable, neutral; clear wavy boundary.

C4—27 to 40 inches; mixed dark grayish brown (10YR 4/2) and 10 percent light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) moist; massive, parts to weak thin plates; slightly hard, very friable; neutral; clear wavy boundary.

C5—40 to 60 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) crushed, mixed black (10YR 2/1) and very dark grayish brown (10YR 3/2) moist; massive, parts to weak thin plates; slightly hard, very friable; neutral.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is dominantly silt loam, but the range includes silty clay loam. The C horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 through 3. It has thin strata that have a higher value. It is dominantly silt loam, but the range includes silty clay loam. Buried A horizons are common. The C horizon ranges from neutral to moderately alkaline.

Holder series

The Holder series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in silty loess. Slope ranges from 1 to 3 percent.

Holder soils are similar to Hastings soils and commonly are adjacent to Butler, Coly, Fillmore, and Uly soils. Hastings soils have a finer textured B2t horizon than Holder soils. Butler soils have a finer and darker colored B2t horizon and are in slightly lower positions on the landscape. Coly soils do not have a mollic epipedon and are on steeper slopes. Fillmore soils have a fine textured B2t horizon and are in shallow depressions. Uly soils do not have an argillic horizon.

Typical pedon of Holder silt loam, 1 to 3 percent slopes, 2,620 feet west and 100 feet north of the southeast corner of sec. 6, T. 15 N., R. 1 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

A12—8 to 13 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

B21t—13 to 18 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; hard, firm; neutral; clear smooth boundary.

B22t—18 to 31 inches; pale brown (10YR 6/3) silty clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium and fine subangular blocky structure; hard, firm; neutral; clear smooth boundary.

B23t—31 to 42 inches; light yellowish brown (10YR 6/4) silty clay loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, firm; neutral; clear smooth boundary.

C—42 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; mildly alkaline.

The solum is 25 to 48 inches thick. Depth to carbonates ranges from 40 to over 60 inches. The mollic epipedon is 10 to 20 inches thick.

The A horizon has value of 3 through 5 (2 or 3 moist) and chroma of 2 or 3. The B2t horizon has value of 4 through 7 (3 through 5 moist) and chroma of 3 or 4. It is silty clay loam. On the average, it is from 28 to 35 percent clay. The C horizon has value of 6 to 7 (5 or 6 moist) and chroma of 2 or 3. It is silt loam or silty clay loam. It is neutral to mildly alkaline.

Inavale series

The Inavale series consists of deep, somewhat excessively drained, rapidly permeable soils on bottom lands of the Platte River. Slope ranges from 0 to 6 percent.

Inavale soils commonly are adjacent to Alda and Boel soils. Alda and Boel soils are somewhat poorly drained and are in lower positions on the landscape.

Typical pedon of Inavale loamy sand, 2 to 6 percent slopes, 650 feet north and 70 feet east of the southwest corner of sec. 13, T. 17 N., R. 4 E.

A—0 to 8 inches; gray (10YR 5/1) loamy sand, very dark grayish brown (10YR 3/2) moist; weak coarse granular structure; loose; neutral; clear smooth boundary.

AC—8 to 13 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; neutral; gradual wavy boundary.

C1—13 to 21 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; neutral; abrupt smooth boundary.

C2—21 to 60 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; single grain; loose; thin strata of finer and coarser textured sediment; neutral.

The solum is 10 to 20 inches thick. The A horizon is 4 to 10 inches thick.

The A horizon has value of 4 to 6 (3 to 5 moist). It typically is loamy sand but ranges from loamy fine sand to sand. The AC and C horizons have value of 5 through 7 (4 through 6 moist). The C horizon commonly is loamy sand in the upper part but ranges from fine sand to sand in the lower part. In places, the C horizon is stratified with thin layers of finer and coarser textured material.

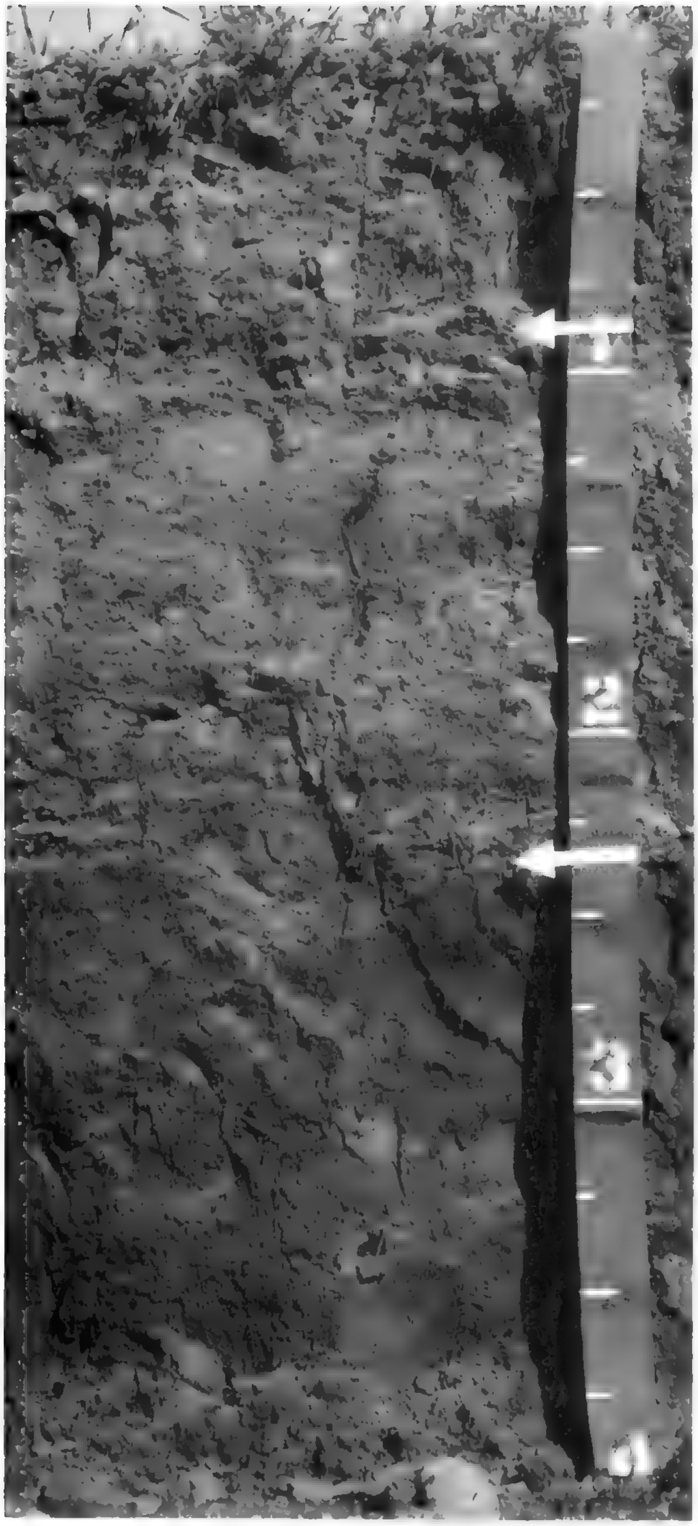

Figure 19.—Profile of Hobbs silt loam, a deep, well drained, stratified soil on bottom lands. The arrows indicate boundaries between stratified layers. Depth is marked in feet.

Judson series

The Judson series consists of deep, well drained, moderately permeable soils on colluvial foot slopes. These soils formed in silty colluvium.

Judson soils are similar to Muir soils and commonly are adjacent to Burchard, Ponca, and Sharpsburg soils. Muir soils have less clay in the B horizon. Burchard soils formed in glacial till and are in higher positions on the landscape. Ponca soils have a thinner mollic epipedon, are shallow to lime, and are in higher positions on the landscape. Sharpsburg soils are not cumulic, have a fine textured B2t horizon, and are in higher positions on the landscape.

Typical pedon of Judson silt loam, 2 to 6 percent slopes, 2,100 feet west and 100 feet south of the northeast corner of sec. 24, T. 13 N., R. 4 E.

A11—0 to 9 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak very fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

A12—9 to 20 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

A3—20 to 25 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak very fine subangular blocky structure; hard, friable; slightly acid; clear smooth boundary.

B21—25 to 31 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak very fine subangular blocky structure; hard, friable; slightly acid; dark coatings on ped faces; clear smooth boundary.

B22—31 to 42 inches; light yellowish brown (10YR 6/4) silty clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable; slightly acid; clear smooth boundary.

B3—42 to 60 inches; very pale brown (10YR 7/3) light silty clay loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, friable; neutral.

The mollic epipedon is 20 to 30 inches thick.

The A horizon has value of 4 or 5 (2 or 3 moist). It is dominantly silt loam, but the range includes loam. The B horizon has value of 4 through 7 (3 through 5 moist) and chroma of 3 or 4. The darker colors are in the upper part of this horizon. It is silty clay loam. On the average, the B horizon is 27 to 35 percent clay.

Kezan series

The Kezan series consists of deep, poorly drained, moderately permeable soils that formed in stratified silty alluvial material. These soils are along upland

drainageways and on flood plains of streams. Slopes range from 0 to 2 percent.

Kezan soils commonly are adjacent to Hastings, Hobbs, Monona, Ponca, Sharpsburg, and Uly soils on uplands. Hastings, Monona, Ponca, Sharpsburg, and Uly soils have a mollic epipedon and a B horizon, which Kezan soils do not have. Hobbs soils are well drained.

Typical pedon of Kezan silt loam, 0 to 2 percent slopes, 2,100 feet south and 200 feet east of the northwest corner of sec. 14, T. 14 N., R. 3 E.

Ap—0 to 6 inches; stratified, mixed grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

C1—6 to 13 inches; stratified, mixed grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; few fine prominent (5YR 4/4) mottles on bedding planes; massive with evident bedding planes; slightly hard, friable; neutral; abrupt smooth boundary.

C2—13 to 19 inches; stratified, mixed dark gray (10YR 4/1) and grayish brown (10YR 5/2) silt loam, very dark gray (10YR 3/1) and dark grayish brown (10YR 4/2) moist; few fine prominent (5YR 4/4) mottles on bedding planes; massive with evident bedding planes; slightly hard, friable; neutral; abrupt smooth boundary.

C3—19 to 32 inches; stratified, mixed grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; few fine prominent (5YR 4/4) mottles on bedding planes; massive with evident bedding planes; slightly hard, friable; neutral; abrupt smooth boundary.

A11b—32 to 44 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; massive; hard, friable; neutral; gradual wavy boundary.

A12b—44 to 60 inches; dark gray (2.5Y 4/0) silt loam, black (2.5Y 2/0) moist; massive; hard, friable; neutral.

The A horizon is 4 to 9 inches thick. It has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The C horizon has value of 4 through 6 (3 or 4 moist) and chroma of 1 or 2. It has thin strata that have higher or lower value. It is dominantly silt loam, but the range includes silty clay loam. The Ab horizon is at a depth below 24 inches. It has value of 4 or 5 (2 or 3 moist) and chroma of 0 through 2. It is neutral or mildly alkaline.

Lamo series

The Lamo series consists of deep, somewhat poorly drained, moderately slowly permeable soils on bottom lands. These soils formed in silty, calcareous alluvial material. Slope ranges from 0 to 2 percent.

Lamo soils are similar to Gibbon soils and commonly are adjacent to Blendon, Boel, Cozad, and Zook soils. Gibbon soils have a mollic epipedon that is less than 20 inches thick. Blendon and Boel soils have a sandy A horizon and are at a slightly higher elevation than Lamo soils. Cozad soils are well drained, have a B horizon, and are in higher positions on the landscape. Zook soils have a fine textured control section.

Typical pedon of Lamo silty clay loam, 0 to 2 percent slopes, 1,300 feet south and 100 feet east of the northwest corner of sec. 16, T. 16 N., R. 3 E.

Ap—0 to 6 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure; slightly hard, very friable; moderately alkaline; strong effervescence; abrupt smooth boundary.

A12—6 to 12 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium granular structure; hard, friable; moderately alkaline; strong effervescence; clear wavy boundary.

AC—12 to 25 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate medium granular structure; hard, firm; moderately alkaline; slight effervescence; clear wavy boundary.

C1—25 to 33 inches; gray (10YR 5/1) silty clay loam, dark gray (10YR 4/1) moist; few fine distinct strong brown (7.5YR 5/6) mottles; moderate fine prismatic structure; hard, firm; moderately alkaline; common medium lime concretions; slight effervescence; clear wavy boundary.

C2—33 to 40 inches; gray (10YR 6/1) silty clay loam, dark gray (10YR 4/1) moist; few fine distinct yellowish brown (7.5YR 5/4) mottles; moderate fine prismatic structure; hard, firm; moderately alkaline; violent effervescence; clear wavy boundary.

C3—40 to 60 inches; gray (10YR 6/1) silty clay loam, gray (10YR 5/1) moist; massive; very hard, firm; moderately alkaline; strong effervescence.

The solum and mollic epipedon are 20 to 35 inches thick. The depth to carbonates ranges from 0 to 10 inches.

The A horizon has value of 3 through 5 (2 or 3 moist). It is dominantly silty clay loam, but the range includes silt loam. The AC horizon has value of 4 or 5 (3 moist) and chroma of 1 or 2. The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 through 6 moist), and chroma of 1 or 2. It is silty clay loam. On the average, it is between 28 and 35 percent clay. In some pedons, there are strata of clay loam or sandier material below 40 inches. The C horizon is mildly or moderately alkaline.

Longford series

The Longford series consists of deep, well drained, slowly permeable soils on rolling uplands. These soils

formed in moderately fine textured loess of the Loveland Formation.

These soils are taxadjuncts to the Longford series because they do not have a mollic epipedon. This difference does not affect the use or behavior of the soils.

Longford soils commonly are adjacent to Burchard, Hastings, Pawnee, Ponca, and Sharpsburg soils. Burchard soils formed in glacial till and are shallow to lime. Pawnee soils formed in glacial till and are at a slightly lower elevation than Longford soils. Ponca soils have less clay in the B horizon. Hastings and Sharpsburg soils formed in Peorian loess and are at a slightly higher elevation.

Typical pedon of Longford silty clay loam, 6 to 11 percent slopes, eroded, 2,490 feet west and 80 feet south of the northeast corner of sec. 12, T. 13 N., R. 3 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

B21—7 to 14 inches; brown (7.5YR 5/2) silty clay, dark brown (7.5YR 4/2) moist; strong medium blocky structure; hard, firm; organic stains in cracks; slightly acid; gradual wavy boundary.

B22t—14 to 24 inches; brown (7.5YR 5/2) silty clay, dark brown (7/5YR 4/2) moist; strong medium blocky structure; hard, firm; shiny surfaces on most peds; many black manganese segregations; slightly acid; gradual smooth boundary.

B23t—24 to 40 inches; light reddish brown (5YR 6/4) silty clay, reddish brown (5YR 4/4) moist; strong medium blocky structure; hard, firm; shiny surfaces on most peds; few manganese segregations; slightly acid; gradual smooth boundary.

B3—40 to 48 inches; light brown (7.5YR 6/4) silty clay, brown (7.5YR 5/4) moist; moderate coarse blocky structure; hard, firm; many fine black manganese segregations; slightly acid; gradual smooth boundary.

C—48 to 60 inches; light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 5/4) moist; massive; hard, friable; few black manganese segregations; neutral.

The solum is 40 to 50 inches thick. Depth to free carbonates ranges from 42 to over 60 inches. The thickness of the A horizon, which is the same as the depth of tillage, ranges from 5 to 8 inches.

The A horizon has value of 4 or 5 (2 or 3 moist). The B2t horizon has hue of 7.5YR or 5YR and value of 5 or 6 (4 or 5 moist) and chroma of 2 through 6. It is darker colored in the upper part. This horizon is silty clay. On the average, it is 40 to 50 percent clay. The C horizon has value of 5 through 7 (4 through 6 moist) and chroma of 3 through 5. It is neutral or mildly alkaline.

Monona series

The Monona series consists of deep, well drained and somewhat excessively drained, moderately permeable soils on uplands (fig. 20). These soils formed in silty, calcareous loess. Slope ranges from 2 to 30 percent.

Monona soils are similar to Ponca soils and commonly are adjacent to Crofton, Judson, and Steinauer soils. Ponca soils are finer textured, and they are shallower to

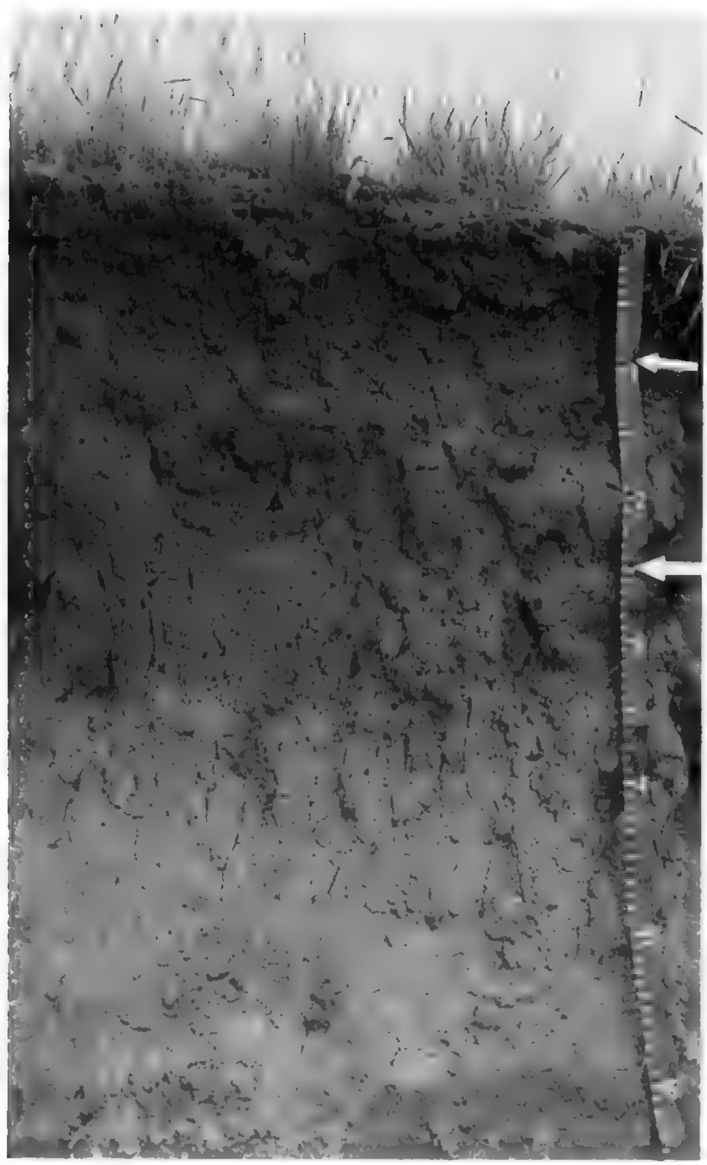

Figure 20.—Profile of Monona silt loam, a deep, well drained soil that has a weakly developed subsoil. The upper part of the subsoil is between the two arrows. Depth is marked in feet.

free carbonates. Crofton soils do not have a mollic epipedon and are calcareous at the surface. Judson soils have a thicker mollic epipedon and are at a lower elevation on foot slopes. Steinauer soils formed in glacial till.

Typical pedon of Monona silt loam, 17 to 30 percent slopes, 2,615 feet south and 900 feet west of the northeast corner of sec. 10, T. 15 N., R. 4 E.

A1—0 to 13 inches; dark grayish brown (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak very fine granular structure; slightly hard, friable; neutral; gradual wavy boundary.

B21—13 to 30 inches; yellowish brown (10YR 5/4) silt loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable; neutral; gradual wavy boundary.

B22—30 to 42 inches; yellowish brown (10YR 5/4) silt loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable; neutral; gradual wavy boundary.

C—42 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; violent effervescence; moderately alkaline.

The solum is 30 to 42 inches thick. Depth to free carbonates ranges from 30 to 45 inches. The mollic epipedon is 10 to 20 inches thick.

The A horizon has value of 4 or 5 (2 or 3 moist). The B horizon has value of 4 through 6 (3 through 5 moist) and chroma of 3 or 4. It is darker colored in the upper part. It is silt loam or silty clay loam. The clay content averages between 24 and 30 percent. The C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 through 4. It is neutral to moderately alkaline.

Map unit MnD2 does not have the mollic epipedon that is prescribed for the Monona series, but this difference does not affect the use or behavior of the soil.

Muir series

The Muir series consists of deep, well drained, moderately permeable soils on foot slopes and stream terraces. These soils formed in silty loess and alluvium. Slope ranges from 0 to 3 percent.

Muir soils are similar to Cozad soils and commonly are adjacent to Hastings and Hobbs soils. Cozad and Hastings soils have a mollic epipedon that is less than 20 inches thick. Hastings soils have an argillic horizon. Hobbs soils have stratified layers in the profile.

Typical pedon of Muir silt loam, 0 to 1 percent slopes, 1,300 feet north and 100 feet west of the southeast corner of sec. 20, T. 16 N., R. 3 E.

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; neutral; abrupt smooth boundary.

A12—6 to 11 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

A13—11 to 20 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; moderate medium granular structure; slightly hard, friable; neutral; clear smooth boundary.

B2—20 to 28 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

B3—28 to 36 inches; pale brown (10YR 6/3) silt loam, dark brown, (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, friable; neutral; clear wavy boundary.

C1—36 to 44 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, friable; neutral; clear wavy boundary.

C2—44 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; massive; slightly hard, friable; neutral.

The solum is 30 to 55 inches thick. The mollic epipedon is 20 to 40 inches thick.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The B horizon has value of 4 to 6 (3 to 5 moist) and chroma of 2 or 3.

Olbut series

The Olbut series consists of deep, somewhat poorly drained, slowly permeable soils that formed in loess. These soils are in shallow depressions on flat uplands. Slope ranges from 0 to 2 percent.

Olbut soils commonly are adjacent to Butler, Fillmore, and Hastings soils. Butler soils do not have appreciable amounts of exchangeable sodium or soluble salts and are deeper to carbonates than Olbut soils. Fillmore soils have an albic horizon, are more poorly drained, and are in lower positions on the landscape. Hastings soils are better drained and have less clay in the Bt horizon.

Typical pedon of Olbut silt loam, in an area of Olbut-Butler silt loams, 0 to 1 percent slopes, 75 feet east and 350 feet north of the southwest corner of sec. 7, T. 15 N., R. 3 E.

Ap—0 to 6 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

B21t—6 to 14 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; strong medium prismatic structure parting to strong medium blocky; hard, firm; moderately alkaline; abrupt smooth boundary.

B22t—14 to 20 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; few fine

distinct yellowish brown (10YR 5/4) mottles; strong medium prismatic structure parting to strong medium blocky; hard, firm; many fine salt clusters; slight effervescence; moderately alkaline; gradual wavy boundary.

B3—20 to 29 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; few fine distinct yellowish brown (10YR 5/4) mottles; moderate medium blocky structure; hard, friable; many fine salt clusters; slight effervescence; moderately alkaline; gradual wavy boundary.

C1—29 to 38 inches; light gray (5Y 7/2) silty clay loam, light olive gray (5Y 6/2) moist; many medium prominent strong brown (7.5YR 5/6) mottles; massive; hard, friable; many medium salt clusters; slight effervescence; strongly alkaline; gradual wavy boundary.

C2—38 to 60 inches; light gray (5Y 7/2) silt loam, light olive gray (5Y 6/2) moist; many coarse prominent strong brown (7.5YR 5/6) mottles; massive; hard, friable; many medium salt clusters; slight effervescence; strongly alkaline.

The solum is 20 to 40 inches thick. The mollic epipedon extends into the B2t horizon. Depth to carbonates ranges from 10 to 24 inches. The lower part of the B horizon contains 10 to 15 percent exchangeable sodium.

The A horizon has value of 4 or 5 dry (2 or 3 moist) and chroma of 1 or 2. It is silt loam or silty clay loam. The A horizon is slightly acid to mildly alkaline. The B2t horizon has value of 4 through 6 (2 through 5 moist) and chroma of 1 or 2. It is from 40 to 50 percent clay. The B2t horizon ranges from slightly acid through moderately alkaline. The B3 horizon has value of 4 through 6 (3 or 4 moist) and chroma of 1 or 2. The C horizon has value of 5 through 7 (4 through 6 moist) and chroma of 1 through 3. It is moderately alkaline or strongly alkaline.

Ovina series

The Ovina series consists of deep, somewhat poorly drained, moderately rapidly permeable soils on bottom lands. These soils formed in mixed loamy and sandy alluvial material. Slope ranges from 0 to 3 percent.

Ovina soils commonly are adjacent to Brocksburg, Gibbon, Simeon, and Thurman soils. Brocksburg soils are well drained and are at a slightly higher elevation. Gibbon soils are in the fine-silty family. Simeon and Thurman soils are better drained, have more sand in the C horizon, and are at a higher elevation than Ovina soils.

Typical pedon of Ovina loamy fine sand, 0 to 3 percent slopes, 2,100 feet west and 60 feet north of the southeast corner of sec. 18, T. 16 N., R. 1 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loamy fine sand, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; mildly alkaline; abrupt smooth boundary.

A12—7 to 16 inches; very dark grayish brown (10YR 3/2) loamy fine sand, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; mildly alkaline; clear smooth boundary.

A13—16 to 21 inches; mixed gray (10YR 5/1) and light brownish gray (10YR 6/2) fine sandy loam, very dark gray (10YR 3/1) and dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable; violent effervescence; moderately alkaline; clear smooth boundary.

Ab—21 to 25 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, friable; violent effervescence; moderately alkaline; clear smooth boundary.

AC—25 to 29 inches; gray (10YR 5/1) fine sandy loam, very dark gray (10YR 3/1) moist; few fine distinct brown (7.5YR 4/2) mottles; weak fine granular structure; soft, very friable; violent effervescence; moderately alkaline; clear smooth boundary.

C1—29 to 48 inches; light gray (10YR 7/2) fine sandy loam, light brownish gray (10YR 6/2) moist; common fine distinct dark brown (7.5YR 3/2) mottles; weak coarse subangular blocky structure; soft, very friable; violent effervescence; moderately alkaline; clear smooth boundary.

C2—48 to 53 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; common fine distinct dark brown (7.5YR 3/2) mottles; massive; slightly hard, firm; many lime concretions; violent effervescence; moderately alkaline; clear smooth boundary.

C3—53 to 60 inches; gray (2.5Y 6/2) loam, dark gray (2.5Y 4/1) moist; common fine distinct dark brown (7.5YR 3/2) mottles; massive; slightly hard, firm; few lime concretions; violent effervescence; moderately alkaline.

The solum and the mollic epipedon are 10 to 20 inches thick. Depth to lime ranges from 10 to 20 inches.

The A horizon has value of 3 through 5 (2 or 3 moist). It is loamy fine sand or fine sandy loam. The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 through 6 moist), and chroma of 1 or 2. It is fine sandy loam or loam.

Pawnee series

The Pawnee series consists of deep, moderately well drained, slowly permeable soils on uplands. These soils formed in moderately fine textured glacial till. Slope ranges from 3 to 11 percent.

These soils are taxadjuncts to the Pawnee series because they do not have a mollic epipedon. This difference does not affect the use or behavior of the soils.

Pawnee soils commonly are adjacent to Burchard, Longford, Sharpsburg, and Steinauer soils. Burchard and Steinauer soils have less clay in the control section than Pawnee soils, and Steinauer soils are calcareous at the surface. Longford soils formed in Loveland loess and are

less clayey in the control section. Sharpsburg soils formed in loess, have less clay in the control section, and are in higher positions on the landscape.

Typical pedon of Pawnee clay loam, 3 to 6 percent slopes, eroded, 1,000 feet west and 120 feet south of the northeast corner of sec. 35, T. 13 N., R. 4 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; slightly hard, friable; medium acid; abrupt smooth boundary.

A12—6 to 9 inches; dark gray (10YR 4/1) clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; slightly hard, friable; medium acid; clear smooth boundary.

B21t—9 to 22 inches; grayish brown (10YR 5/2) clay, dark brown (10YR 4/3) moist; strong coarse blocky structure; hard, very firm; dark organic stains on ped faces; few pebbles; slightly acid; clear smooth boundary.

B22t—22 to 30 inches; brown (10YR 5/3) clay, dark yellowish brown (10YR 4/4) moist; strong medium prismatic structure; hard, very firm; dark organic stains on ped faces; few pebbles; neutral; clear smooth boundary.

B23t—30 to 38 inches; yellowish brown (10YR 5/2) clay, dark yellowish brown (10YR 4/4) moist; strong medium prismatic structure; hard, very firm; dark material in pockets; few pebbles; strong effervescence in seams; neutral; gradual smooth boundary.

B3—38 to 45 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; common coarse distinct strong brown (7.5YR 5/6) mottles; strong medium blocky structure; hard, very firm; few pebbles; strong effervescence in seams; moderately alkaline; gradual smooth boundary.

C—45 to 60 inches; pale yellow (2.5Y 7/2) clay loam, light yellowish brown (2.5Y 6/4) moist; moderate medium blocky structure; slightly hard, firm; many coarse lime segregations; many manganese segregations; few pebbles; violent effervescence; moderately alkaline.

The solum is 36 to 50 inches thick. Depth to free carbonates ranges from 30 to 40 inches.

The A horizon has value of 3 through 5 (2 or 3 moist) and chroma of 1 or 2. The B2t horizon has value of 4 through 6 (3 through 5 moist) and chroma of 2 through 4. The B2t horizon is clay. Its clay content, on the average, is 40 to 45 percent. The solum is noncalcareous except in the lower part, which has seams of lime. The C horizon has value of 5 through 7 and chroma of 2 through 4. It contains both disseminated and concretionary lime.

Ponca series

The Ponca series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in silty, calcareous loess. Slope ranges from 2 to 30 percent.

These soils are taxadjuncts to the Ponca series because they do not have a mollic epipedon. This difference does not affect the use and behavior of the soils.

Ponca soils are similar to Sharpsburg soils and commonly are adjacent to Crofton, Longford, and Steinauer soils. Sharpsburg soils have a finer textured B horizon and are at a slightly higher elevation than Ponca soils. Crofton soils do not have a B horizon and are calcareous at the surface. Longford soils formed in Loveland loess, have a finer textured B horizon, and are below Ponca soils on the landscape. Steinauer soils formed in glacial till, are calcareous at the surface, and are below Ponca soils on the landscape.

Typical pedon of Ponca silty clay loam, 6 to 11 percent slopes, eroded, 800 feet east and 110 feet south of the northwest corner of sec. 29, T. 15 N., R. 4 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

B2—7 to 15 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; common medium prominent mottles, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; hard, friable; many medium manganese segregations; neutral; clear smooth boundary.

B3—15 to 22 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; few medium prominent mottles, yellowish red (5YR 4/6) moist; weak coarse subangular blocky structure; hard, friable; many vesicular pores; neutral; clear smooth boundary.

C1—22 to 27 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; many coarse prominent mottles, yellowish red (5YR 4/6) moist; weak coarse subangular blocky structure; hard, very friable; many vesicular pores; many large lime concretions; violent effervescence; moderately alkaline; clear smooth boundary.

C2—27 to 36 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; many coarse prominent mottles, yellowish red (5YR 4/6) moist; massive; slightly hard, very friable; many vesicular pores; many large lime concretions; few loess lime concretions three-fourths of an inch in diameter; violent effervescence; moderately alkaline; clear smooth boundary.

C—36 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; many coarse prominent mottles, yellowish red (5YR 4/6) moist; slightly hard, very friable; many vesicular pores; violent effervescence; moderately alkaline.

The solum is 16 to 32 inches thick. Depth to carbonates ranges from 14 to 25 inches. The mollic epipedon is 7 to 10 inches thick.

The A horizon has value of 3 through 5 (4 moist) and chroma of 2 or 3. It is slightly acid or neutral. The B horizon has value of 4 through 6 (3 through 5 moist) and chroma of 2 or 3. It is neutral or mildly alkaline. It is dominantly silty clay loam, but the range includes silt loam. The clay content averages 25 to 30 percent. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 through 4. It typically is silt loam, but the range includes silty clay loam.

Saltine series

The Saltine series consists of deep, somewhat poorly drained, moderately slowly permeable soils on bottom lands along the Platte River. These soils formed in silty alluvium. The soils contain salts and alkali. Slope ranges from 0 to 1 percent.

Saltine soils commonly are adjacent to Gibbon, Lamo, Silver Creek, and Zook soils on the landscape. Gibbon and Lamo soils have a mollic epipedon. Silver Creek and Zook soils are in the fine family and have a mollic epipedon.

Typical pedon of Saltine silt loam, in an area of Saltine-Gibbon silt loams, 0 to 1 percent slopes, 1,760 feet east and 100 feet south of northwest corner of sec. 14, T. 16 N., R. 2 E.

Ap—0 to 7 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable; strong effervescence; strongly alkaline; abrupt smooth boundary.

A2—7 to 9 inches; dark gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable; violent effervescence; strongly alkaline; clear smooth boundary.

B21—9 to 16 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; slightly hard, friable; violent effervescence; strongly alkaline; clear smooth boundary.

B22—16 to 25 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; few faint brown (10YR 5/3) mottles; weak coarse subangular blocky structure; hard, friable; violent effervescence; strongly alkaline; clear smooth boundary.

C—25 to 60 inches; light gray (10YR 7/1) silty clay loam, light brownish gray (10YR 6/2) moist; common fine faint brown (10YR 5/3) mottles; massive; hard, friable; many lime segregations; few lime concretions; few fine salt clusters; violent effervescence; strongly alkaline.

The solum is 16 to 30 inches thick. Depth to carbonates ranges from 0 to 10 inches. Conductivity of the saturation extract ranges between 4 and 8 millimhos per centimeter. Sodium absorption ratio is greater than 13.

The A horizon has value of 4 or 5 (2 or 3 moist). It is silt loam, loam, or silty clay loam. The B2 horizon has value of 5 or 6 (4 or 5 moist) and chroma of 1 or 2. The C horizon has value of 5 through 7 (4 through 6 moist) and chroma of 1 through 3. It is dominantly silty clay loam, but coarser textures are common below a depth of 40 inches. It is moderately alkaline to strongly alkaline. Salt clusters are common to absent.

Scott series

The Scott series consists of deep, very poorly drained soils in upland depressions. The soils formed in silty loess. Permeability is very slow. Slope ranges from 0 to 1 percent.

Scott soils are similar to Fillmore soils and commonly are adjacent to Butler and Hastings soils. Fillmore soils are better drained and have a thicker A1 horizon than Scott soils. Butler and Hastings soils are better drained than Scott soils. Butler soils have a thicker A horizon. Hastings soils do not have an A2 horizon, have higher chroma, and have less clay in the argillic horizon.

Typical pedon of Scott silt loam, 0 to 1 percent slopes, 100 feet north and 100 feet west of the southeast corner of the southwest quarter of sec. 30, T. 14 N., R. 2 E.

Ap—0 to 6 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak very fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A2—6 to 10 inches; light gray (10YR 7/1) silt loam, gray (10YR 5/1) moist; weak very thin platy structure; soft, very friable; slightly acid; clear irregular boundary.

B21t—10 to 20 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; strong coarse prismatic structure parting to strong medium blocky; very hard, very firm; light gray coatings along cracks and on ped faces; neutral; gradual wavy boundary.

B22t—20 to 36 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; few fine distinct yellowish brown (10YR 5/4) mottles; strong coarse prismatic structure parting to strong medium blocky; very hard, very firm; neutral; gradual wavy boundary.

B3—36 to 49 inches; light gray (10YR 6/1) silty clay loam, gray (10YR 5/1) moist; strong medium blocky structure; hard, firm; neutral; gradual wavy boundary.

C—49 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; common fine prominent yellowish red (5YR 4/6) mottles; massive; hard, friable; neutral.

The solum is 30 to 55 inches thick. The A1 horizon is 4 to 10 inches thick.

The A1 horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The A2 horizon has value of 5 or 6 (4 or 5 moist) and chroma of 1. The B2t horizon has value

of 3 through 7 (3 through 5 moist) and chroma of 1 or 2. It is silty clay or clay. Its clay content is, on the average, between 40 and 55 percent. In some places, there is lime in the C horizon.

Sharpsburg series

The Sharpsburg series consists of deep, moderately well drained soils on loess uplands (fig. 21). Permeability is moderately slow. The soils formed in silty loess. Slope ranges from 0 to 11 percent.

Sharpsburg soils are similar to Hastings soils and commonly are adjacent to Longford, Monona, and Pawnee soils. Hastings soils are in a drier climate. Longford soils formed in material of the Loveland Formation. Monona soils have less clay in the subsoil and are not leached so deeply. Pawnee soils formed in glacial till and have more clay in the B horizon.

Typical pedon of Sharpsburg silty clay loam, 0 to 2 percent slopes, 500 feet west and 60 feet south of the northeast corner of sec. 4, T. 14 N., R. 4 E.

Ap—0 to 6 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate fine granular structure with blockiness caused by compaction; slightly hard, friable; slightly acid; abrupt smooth boundary.

A12—6 to 12 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; slightly hard, friable; slightly acid; gradual smooth boundary.

B1—12 to 15 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; slightly hard, friable; slightly acid; gradual smooth boundary.

B2t—15 to 33 inches; pale brown (10YR 6/3) heavy silty clay loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm; dark films on surfaces of peds; dark material in root channels; slightly acid; gradual smooth boundary.

B3—33 to 46 inches; light yellowish brown (10YR 6/4) medium silty clay loam, brown (10YR 5/3) moist; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, firm; neutral; gradual smooth boundary.

C—46 to 60 inches; very pale brown (10YR 7/2) silt loam, brown (10YR 5/3) moist; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; soft, friable; many vesicular pores; neutral.

The solum is 40 to 54 inches thick. Depth to free carbonates ranges from 4 feet to many feet. The mollic epipedon is 10 to 20 inches thick.

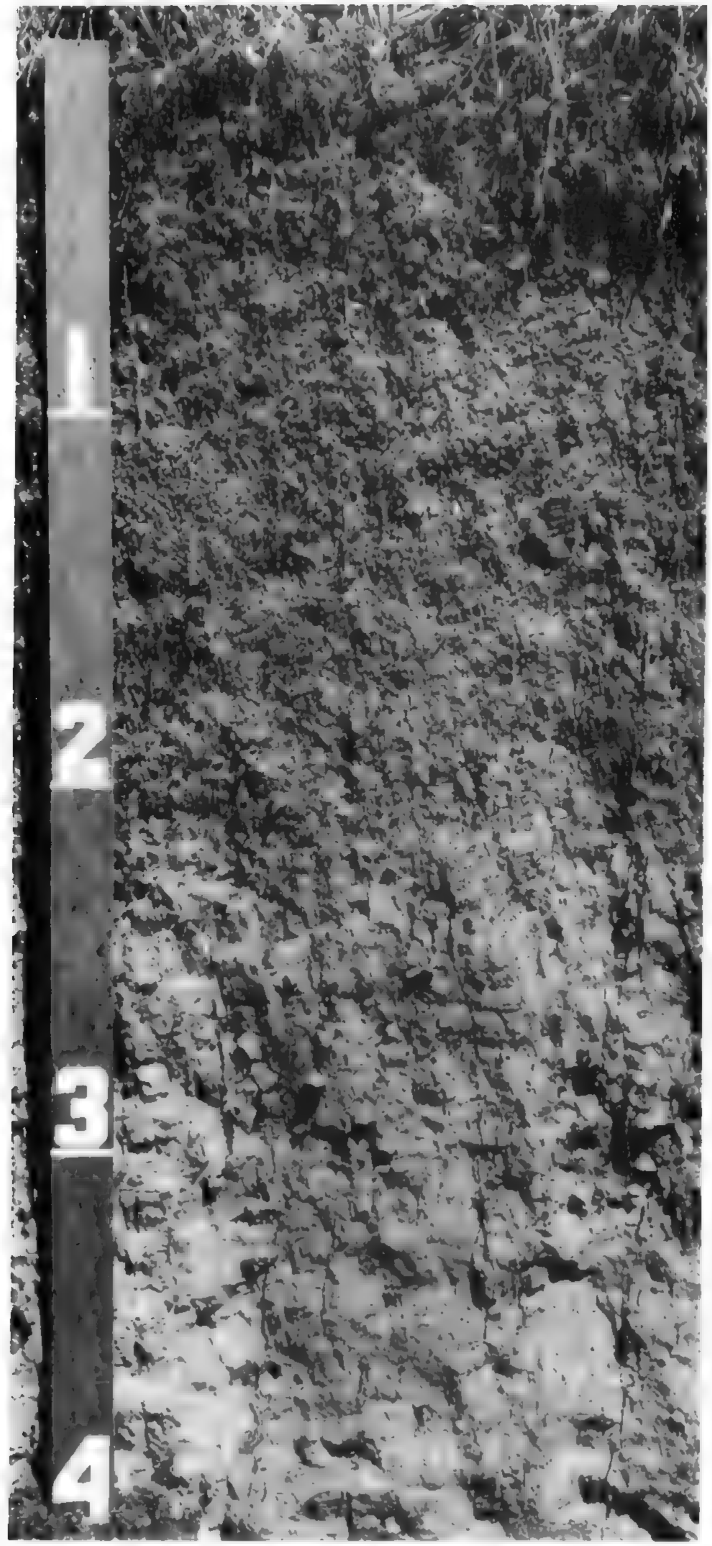

Figure 21.—Profile of Sharpsburg silty clay loam, a deep, well drained soil that has a well developed subsoil. Depth is marked in feet.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The B2 horizon has hue of 10YR to 2.5Y, value of 4 through 7 (3 through 5 moist), and chroma of 2 through 4. It is silty clay loam or silty clay. Its clay content averages between 36 and 40 percent. The B2 horizon is slightly acid or neutral. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 3 or 4.

Map units ShC2 and ShD2 do not have a mollic epipedon, which is definitive for the Sharpsburg series, but this difference does not affect the use or behavior of the soils.

Silver Creek series

The Silver Creek series consists of deep, somewhat poorly drained, slowly permeable soils on bottom lands and low terraces of the Platte River. These soils formed in loamy alluvium that contains appreciable amounts of salts. Slope ranges from 0 to 2 percent.

Silver Creek soils commonly are adjacent to Gibbon, Lamo, and Zook soils. Gibbon, Lamo, and Zook soils do not have soluble salts and exchangeable sodium.

Typical pedon of Silver Creek silt loam, in an area of Silver Creek complex, 0 to 2 percent slopes, 900 feet south of the northwest corner of the northeast quarter of sec. 11, T. 16 N., R. 3 E.

Ap—0 to 6 inches; very dark gray (10YR 3/1) silt loam, black (N 2/0) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; very hard, firm; strongly alkaline; slight effervescence; abrupt smooth boundary.

A12—6 to 15 inches; very dark gray (10YR 3/1) clay loam, black (N 2/0) moist; strong medium blocky structure; hard, firm; shiny peds; few fine salt segregations; strongly alkaline; strong effervescence; clear smooth boundary.

B2t—15 to 23 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; strong medium blocky structure; very hard, firm; shiny peds; many coarse salt segregations; moderately alkaline; violent effervescence; clear smooth boundary.

C1—23 to 35 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark gray (5Y 4/1) moist; common medium prominent red (2.5YR 4/6) mottles; massive; very hard, firm; many coarse salt segregations; moderately alkaline; violent effervescence in seams; clear smooth boundary.

C2—35 to 45 inches; olive gray (5Y 5/2) sandy clay loam, dark gray (5Y 4/1) moist; many medium prominent red (2.5YR 4/6) mottles; massive; very hard, firm; many medium salt threads and segregations in seams; strongly alkaline; violent effervescence; gradual smooth boundary.

C3—45 to 50 inches; olive gray (5Y 5/2) sandy clay loam, gray (5Y 5/1) moist; common medium prominent red (2.5YR 4/6) mottles; massive; very hard, firm; many medium salt segregations; strongly alkaline; violent effervescence; abrupt smooth boundary.

IIC—50 to 60 inches; olive gray (5Y 5/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; few medium prominent dark reddish brown (5YR 3/4) mottles; single grain; hard, loose; moderately alkaline.

The solum is 18 to 30 inches thick. The mollic epipedon is 20 to 30 inches thick.

The A horizon has value of 3 through 6 (2 or 3 moist) and chroma of 0 to 1. The A horizon ranges from silt loam to silty clay loam. The B2t horizon has value of 3 through 6 (2 or 3 moist) and chroma of 1 to 2. Its clay content is 38 to 48 percent. The C horizon has hue of 2.5Y or 5Y, value of 4 through 6 (3 through 5 moist), and chroma of 1 or 2. It has few to many mottles. It is sandy clay loam or clay loam. Its clay content ranges between 22 and 35 percent. In some places, there is a IIC horizon that is loamy sand or sand.

Simeon series

The Simeon series consists of deep, excessively drained, rapidly permeable soils on high terraces of the Platte River. These soils formed in sandy alluvium and eolian sand. Slope ranges from 0 to 3 percent.

Simeon soils are near Brocksburg, Muir, and Thurman soils. Brocksburg soils have a much finer textured layer in the upper part of the control section and are at a slightly lower elevation than Simeon soils. Muir soils have a fine-silty control section and are at a slightly lower elevation. Thurman soils have a mollic epipedon and do not have coarse sand and gravel in the control section.

Typical pedon of Simeon loamy sand, 0 to 3 percent slopes, 2,615 feet south and 75 feet east of the northwest corner of sec. 20, T. 16 N., R. 1 E.

Ap—0 to 8 inches; dark gray (10YR 4/1) loamy sand, very dark gray (10YR 3/1) moist; weak very fine granular structure; soft, very friable; medium acid; abrupt smooth boundary.

A12—8 to 13 inches; dark grayish brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; medium acid; clear smooth boundary.

AC—13 to 20 inches; brown (10YR 5/3) loamy coarse sand, dark brown (10YR 4/3) moist; single grain; loose moist and dry; neutral; abrupt smooth boundary.

C1—20 to 40 inches; pale brown (10YR 6/3) coarse sand, brown (10YR 5/3) moist; single grain; loose moist and dry; neutral; clear smooth boundary.

C2—40 to 60 inches; light gray (10YR 7/2) coarse sand, light brownish gray (10YR 6/2) moist; single grain; loose moist and dry; neutral.

The solum is 10 to 20 inches thick. The depth to coarse sand mixed with gravel is the same as the thickness of the solum.

The A horizon has value of 4 through 6 (3 through 5 moist), and the content of organic matter averages less than 1 percent. The AC horizon has value of 4 through 6 (4 or 5 moist) and chroma of 2 or 3. The C horizon has value of 5 through 7 (4 through 6 moist). The content of gravel ranges to as much as 15 percent, by volume. The sand is dominantly medium and coarse.

Steinauer series

The Steinauer series consists of deep, well drained to excessively drained, moderately slowly permeable soils on uplands (fig. 22). These soils formed in calcareous glacial till. Slope ranges from 6 to 70 percent.

Steinauer soils are near Burchard, Hobbs, Pawnee, and Ponca soils. Burchard soils have a mollic epipedon and a B horizon. Hobbs soils are on bottom lands and are stratified. Pawnee soils have a B horizon and are at a slightly higher elevation than Steinauer soils. Ponca soils have a B horizon and a noncalcareous surface layer; they formed in loess.

Typical pedon of Steinauer clay loam, 11 to 30 percent slopes, 850 feet north and 100 feet west of the southeast corner of sec. 35, T. 17 N., R. 4 E.

A1—0 to 6 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak very fine granular structure; slightly hard, friable; few pebbles; mildly alkaline; clear smooth boundary.

AC—6 to 18 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, friable; few pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.

C1—18 to 36 inches; pale brown (10YR 6/3) clay loam, grayish brown (10YR 5/2) moist; few medium prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; hard, friable; many coarse lime concretions; few pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.

C2—36 to 60 inches; light gray (10YR 7/2) clay loam, pale brown (10YR 6/3) moist; many coarse prominent strong brown (7.5YR 5/8) mottles; strong medium blocky structure; very hard, firm; many coarse lime segregations; few pebbles; violent effervescence; moderately alkaline.

The solum is 8 to 20 inches thick. Depth to free carbonates ranges from near the surface to 12 inches.

The A horizon has value of 4 through 6 (3 through 5 moist). The AC horizon has value of 5 or 6 (4 or 5 moist). The C horizon has value of 6 or 7 (5 or 6 moist). It has prominent medium to large lime segregations.

Figure 22.—Profile of Steinauer clay loam, a deep soil that is calcareous at or near the surface and has many rocks and pebbles. The marker shows the depth at which the underlying material begins. Depth is marked in feet.

Thurman series

The Thurman series consists of deep, somewhat excessively drained, rapidly permeable soils on terraces and uplands. These soils formed in eolian fine sands. Slope ranges from 3 to 11 percent.

Thurman soils are near Brocksburg, Ovina, and Simeon soils. Brocksburg soils have a much finer textured layer in the upper part of the control section and coarser sand in the C horizon. Ovina soils are somewhat poorly drained, are finer textured throughout the profile, and are at a slightly lower elevation. Simeon soils do not have a mollic epipedon and have coarse sand in the AC and C horizons.

Typical pedon of Thurman loamy fine sand, in an area of Ovina- Thurman loamy fine sands, 0 to 6 percent slopes, 2,580 feet south and 60 feet west of the northeast corner of sec. 23, T. 16 N., R. 2 E.

Ap—0 to 10 inches; brown (10YR 5/3) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; loose; slightly acid; abrupt smooth boundary.

AC—10 to 16 inches; yellowish brown (10YR 5/4) loamy fine sand, dark brown (10YR 4/3) moist; weak medium granular structure; soft, very friable; neutral; gradual smooth boundary.

C1—16 to 60 inches; yellowish brown (10YR 5/4) fine sand, dark brown (10YR 4/3) moist; single grain; loose; neutral.

The solum is 14 to 28 inches thick. The mollic epipedon is 10 to 20 inches thick.

The A horizon has value of 3 through 5 (2 or 3 moist). Mollic colors can extend below 20 inches, but the content of organic matter averages too low to be mollic. The C horizon has value of 5 or 6 and chroma of 3 or 4. It is loamy fine sand or fine sand and has coarser material lower in the profile.

Map unit ThC has a mollic epipedon thicker than that defined for the Thurman series, but this difference does not affect the use or behavior of the soil.

Uly series

The Uly series consists of deep, well drained and somewhat excessively drained, moderately permeable soils on uplands. These soils formed in silty, calcareous loess. Slope ranges from 11 to 30 percent.

Uly soils are similar to Coly soils and commonly are adjacent to Cozad, Hobbs, Holder, and Thurman soils on the landscape. Coly soils do not have a mollic epipedon and are calcareous near the surface. Cozad soils have a thicker solum and are at a lower elevation than Uly soils. Hobbs soils are stratified and are on flood plains. Holder soils have an argillic horizon. Thurman soils are sandy throughout.

Typical pedon of Uly silt loam, in an area of Uly-Coly silt loams, 15 to 30 percent slopes, 1,450 feet north and 275 feet east of the southwest corner of sec. 36, T. 16 N., R. 1 E.

A1—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable; neutral; clear smooth boundary.

B21—8 to 14 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak fine prismatic structure parting to weak medium subangular blocky; soft, friable; organic material in root channels; neutral; clear smooth boundary.

B22—14 to 23 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak medium prismatic structure; soft, friable; neutral; clear smooth boundary.

C1—23 to 38 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; few fine faint yellowish brown (10YR 5/6) relict mottles; weak coarse subangular blocky structure; soft, very friable; common fine lime concretions; mildly alkaline; violent effervescence; gradual smooth boundary.

C2—38 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; soft, very friable; few fine lime segregations; mildly alkaline; violent effervescence.

The solum is 12 to 30 inches thick. Depth to free carbonates ranges from 12 to 30 inches. The mollic epipedon is 8 to 12 inches thick.

The A horizon has value of 3 through 5 (2 or 3 moist). The B horizon has value of 4 through 7 (3 through 5 moist) and chroma of 2 or 3. It is silt loam or silty clay loam. The clay content averages between 18 and 29 percent. The C horizon has hue of 10YR or 2.5Y, value of 6 through 8 (5 or 6 moist), and chroma of 2 or 3.

Map units UaF2, UcF2, and UhF2 do not have a mollic epipedon, which is definitive for the Uly series, but this difference does not affect the use and behavior of the soils.

Uly Variant

The Uly Variant consists of deep, moderately well drained, moderately slowly permeable soils on terraces. These soils formed in silty, calcareous loess. Slope ranges from 3 to 6 percent.

Uly Variant soils are similar to Uly soils and commonly are adjacent to Butler, Hall, Hobbs, and Muir soils on the landscape. Butler soils have a thicker mollic epipedon than Uly Variant soils. Hall soils have a mollic epipedon more than 20 inches thick. Hobbs soils are stratified and are at a lower elevation. Muir soils have a mollic epipedon more than 20 inches thick and are at a lower elevation. Uly soils have a mollic epipedon and do not have salts in the B horizon.

Typical pedon of Uly Variant silty clay loam, 3 to 6 percent slopes, eroded, 1,410 feet north and 600 feet east of the southwest corner of sec. 13, T. 13 N., R. 1 E.

Ap—0 to 6 inches; grayish brown (10YR 4/2) silty clay loam, dark brown (10YR 3/2) moist; massive; hard, very firm; mildly alkaline; abrupt smooth boundary.

B21—6 to 10 inches; light yellowish brown (10YR 6/4) silty clay loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure; slightly hard, friable; dark material in worm channels; mildly alkaline; clear smooth boundary.

B22—10 to 15 inches; light yellowish brown (10YR 6/4) silty clay loam, brown (10YR 5/3) moist; common medium prominent strong brown (7.5YR 5/6) relict mottles; weak coarse subangular blocky structure; slightly hard, friable; common fine lime segregations and salt clusters; moderately alkaline; gradual wavy boundary.

C1—15 to 32 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; common medium prominent strong brown (7.5YR 5/6) relict mottles; weak coarse subangular blocky structure; soft, friable; common fine lime segregations; violent effervescence; moderately alkaline; gradual wavy boundary.

C2—32 to 60 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; common medium prominent strong brown (7.5YR 5/6) and gray (10YR 5/1) relict mottles; massive; soft, friable; few medium lime segregations; strong effervescence; moderately alkaline.

The solum is 12 to 24 inches thick. Depth to free carbonates ranges from 12 to 24 inches. The A horizon is 5 to 8 inches thick.

The A horizon has value of 4 or 5 (2 or 3 moist). The B2 horizon has value of 5 through 7 (3 through 5 moist) and chroma of 2 through 4. It is silty clay loam. The clay content averages between 27 and 35 percent. The B2 horizon is mildly alkaline or moderately alkaline. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 3 or 4. It is moderately alkaline.

Wood River series

The Wood River series consists of deep, moderately well drained, slowly permeable soils that formed in silty alluvium on terraces. Slope ranges from 1 to 3 percent.

Wood River soils commonly are adjacent to Butler, Hall, Hobbs, and Muir soils. Butler soils are more poorly drained than Wood River soils and do not have a natric horizon. Hall soils are cumulic. Hobbs soils are stratified throughout and are on flood plains. Muir soils are cumulic and do not have an argillic horizon.

Typical pedon of Wood River silt loam, 1 to 3 percent slopes, 1,340 feet west and 180 feet north of the southeast corner of sec. 21, T. 13 N., R. 2 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; slightly hard, very friable; medium acid; abrupt smooth boundary.

A2—6 to 9 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure; slightly hard, very friable; medium acid; abrupt smooth boundary.

B21t—9 to 17 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; strong medium columnar structure; very hard, very firm; dark stains on ped faces; mildly alkaline; clear wavy boundary.

B22t—17 to 24 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; strong medium prismatic structure; very hard, very firm; moderately alkaline; clear wavy boundary.

B3sa—24 to 33 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; very hard, firm; few fine prominent salt accumulations; moderately alkaline; slight effervescence in seams; clear wavy boundary.

C1—33 to 39 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, friable; few fine prominent lime segregations; moderately alkaline; slight effervescence in seams; clear wavy boundary.

C2—39 to 60 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; few coarse prominent reddish brown (5YR 4/4) mottles; massive; hard, friable; few to many medium lime segregations and concretions; violent effervescence in seams; moderately alkaline.

The solum is 25 to 48 inches thick. Depth to lime ranges from 18 to 30 inches.

The A1 horizon has value of 3 or 4 (2 or 3 moist). The A2 horizon has value of 4 through 6 (3 or 4 moist) and chroma of 1 or 2. The B2t horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It is silty clay or silty clay loam. The clay content averages between 35 and 45 percent. The B3sa horizon has few to many salt accumulations.

The C horizon has value of 6 through 8 (5 or 6 moist) and chroma of 3 or 4.

Zook series

The Zook series consists of deep, poorly drained, slowly permeable soils on bottom lands. These soils formed in clayey alluvium. Slope ranges from 0 to 2 percent.

Zook soils are near Blendon, Gibbon, Lamo, and Silver Creek soils. Blendon soils have more sand throughout than Zook soils. Gibbon and Lamo soils have more sand, and they are calcareous. Silver Creek soils contain soluble salts and exchangeable sodium.

Typical pedon of Zook silty clay loam, 0 to 2 percent slopes, 1,300 feet west and 75 feet north of the southeast corner of sec. 16, T. 16 N., R. 3 E.

Ap—0 to 6 inches; very dark gray (10YR 3/1) silty clay loam, black (N 2/0) moist; moderate fine subangular

blocky structure; very hard, firm; neutral; abrupt smooth boundary.

A12—6 to 13 inches; very dark gray (10YR 3/1) silty clay, black (N 2/0) moist; moderate medium granular structure; very hard, firm; neutral; gradual smooth boundary.

A13—13 to 23 inches; very dark gray (10YR 3/1) silty clay, black (N 2/0) moist; moderate medium granular structure; very hard, firm; neutral; gradual smooth boundary.

A3—23 to 37 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (5Y 3/1) moist; moderate medium subangular blocky structure; very hard, firm; neutral; gradual irregular boundary.

B2—37 to 51 inches; dark gray (10YR 4/1) silty clay, very dark gray (5Y 3/1) moist; weak medium subangular blocky structure; very hard, firm; neutral; gradual wavy boundary.

C—51 to 60 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 4/2) moist; commmon medium distinct reddish brown (5YR 4/4) mottles; massive; very hard, firm; neutral.

The solum is 40 to 60 inches thick. The mollic epipedon is 36 to 44 inches thick.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 0 or 1. It is silty clay loam, silt loam, or silty clay. The B horizon has hue of 2.5Y or 5Y, value of 4 to 6 (3 or 5 moist), and chroma of 1 or 2. The clay content ranges from 38 to 45 percent. The C horizon has hue of 2.5Y or 5Y and color value of 4 to 6 (3 or 5 moist). It has few to many mottles.

formation of the soils

Soil is produced by soil-forming processes that act on material deposited or accumulated by geologic forces. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has existed, the plant and animal life on and in the soil, the relief, or lay of the land, and the length of time the processes of soil formation have acted on the soil material.

Climate and plants and, to a lesser degree, animals are the active factors in soil formation. They act on the parent material that has accumulated and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also influences the kind of soil that is formed and in extreme cases determines it almost entirely. Finally, time is needed for changing the parent material into soil and for the differentiation of soil horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

parent material

Parent material is the unconsolidated mineral material in which a soil forms. It determines the chemical and mineralogical composition of the soil. The soils in Butler County formed in different kinds of parent material: Peoria loess, Loveland loess, Kansan glacial till, alluvial material, and eolian sand. These parent materials are of Pleistocene age or younger.

Peoria loess is the most extensive parent material in the county. It is light gray or very pale brown silty windblown material that mantles all of the uplands and parts of the Platte River Valley and the Big Blue River Valley. On the uplands, this loess ranges in thickness from 25 to 60 feet. In the Platte River Valley, it is 3 to 25 feet thick.

The youngest loess in the county is that in the Platte River Valley and on the upland breaks to the valley. The loess is thickest on the breaks to the Platte River. The loess in the Platte River Valley is slightly coarser textured than that on the uplands. In the western and central parts of the county, Butler, Coly, Fillmore, Hastings, Holder, Scott, and Uly soils formed in Peoria loess. Crofton, Monona, Ponca, and Sharpsburg soils formed in Peoria loess in the eastern part of the county. Hall, Judson, and Muir soils formed in loess and loesslike material of alluvial origin on stream terraces.

Reddish brown loess of the Loveland Formation was deposited over most of the county. It covers till on the eastern part of the county and blankets sand and gravel in the western part. It is silty clay loam or finer textured material that, for the most part, outcrops on the sloping sides of drainageways. Longford soils are the only soils in Butler County that formed in Loveland loess. The total acreage of these soils is small in this county, but in some places Longford soils constitute an appreciable part of the landscape.

The eastern part of the county was covered by Kansan glacial till, which overlies till of the earlier Nebraskan glacial stage. This glacial till rests on limestone, shale, and sandstone bedrock. As the glaciers retreated, material consisting of clay loam till and containing stones, boulders, and pockets of sand and gravel was left on the surface. Pawnee, Burchard, and Steinauer soils formed in Kansan till.

Most of the soil material on the Platte River flood plains and terraces was deposited by water. This alluvial material ranges in texture from coarse to fine and in thickness from 7 inches to 3 feet or more. Alda, Boel, Gibbon, Lamo, Ovina, and Zook soils formed in alluvium on the Platte River bottom lands.

The alluvium on the bottom lands along the Big Blue River, its tributaries, and other creeks is material that was recently washed from uplands. These deposits are not so variable in texture as the alluvium in the Platte River Valley. For the most part, they are darker colored and more silty. Hobbs and Kezan soils formed in this recent alluvium.

Stream terraces in the Platte River Valley are covered with alluvium that has been in place longer than the alluvium on bottom lands. Blendon, Brocksburg, Cozad, Muir, and Simeon soils formed on stream terraces. These soils range from coarse textured to moderately fine textured. They are 10 inches to more than 40 inches thick.

Eolian sand is on stream terraces of the Platte River Valley where the topography commonly is gently undulating or hummocky. Simeon soils, the upper part of Brocksburg soils, and Thurman soils formed in this material.

climate

Climate affects the formation of soils through its influence on the rate of weathering and reworking of parent material by rainfall, temperature, and wind. Because soil formation progresses slowly when the soil is dry, soils in arid regions generally are less well developed than those in humid regions. The amount of moisture, the length of the growing season, and the prevailing temperature during the growing season affect the amount of vegetation, which is the main source of organic matter in the soil. These climatic factors also directly affect the activity of the micro-organisms that convert organic matter to humus. Wind can remove the surface layer of the soil or deposit a mantle of sediment on the soil.

Butler County has a mid-continental climate that is characterized by wide seasonal variations. Temperatures above 100° F and below 0° F are common. The annual average precipitation is 28.8 inches. Except for minor variations, the climate is reasonably uniform throughout the county. Thus, climate alone does not account for differences in the soils of the county.

plant and animal life

The native vegetation in Butler County was mainly tall, mid, and short grasses. Trees grew in narrow bands along the streams. Aquatic plants were abundant in low, wet areas near the Platte River and in basins on the nearly level uplands. Plants supplied an abundance of organic matter that resulted in the formation of a friable and fertile dark surface layer. All the soils in Butler County formed under native grasses. The fibrous roots of the grasses penetrated the soil and made it more porous. Dead roots supplied organic matter, which decomposed and was used by plants. When the tops of the plants died, organic matter was deposited on the surface and was eventually worked into the surface layer of the soil.

Animal life in the soil converts organic matter to humus, fixes nitrogen from the air in a form usable by plants, and mixes and moves the soil from place to place. Soil micro-organisms, such as bacteria, fungi, or nematodes, help to change organic matter to a form in which its nutrients are available to plants. Earthworms digest organic matter and mix it with soil particles. Burrowing animals and earthworms mix soil material and make openings for air and water to enter and move through the soil.

Man cultivates the soil, alters drainage conditions, maintains fertility, and changes the type of vegetation. These activities can have important effects on the rate and direction of soil formation.

relief

Relief is one of the major factors affecting runoff, drainage, and water erosion. Butler County has a wide range of relief and of natural drainage conditions. Steep slopes like those on breaks to the Platte River Valley have very rapid runoff. Most of the rainwater runs off instead of soaking into the soil. Consequently, the steeper soils are less developed than those on gentler slopes. Steep soils have a thinner solum and a lighter colored surface layer than more gently sloping soils that formed in similar parent material. In the steeper soils, less moisture is available for plant growth and microbiological activity, and the soil horizons are indistinct and thin. Lime is not leached deeply in steep soils, for example, Coly silt loam.

Nearly level soils generally have a thick surface layer and subsoil. Much of the rainwater soaks into these soils, promoting plant growth, biological activity, and soil development. Level soils have a thicker and finer textured subsoil than that of steep soils. The nearly level Butler and Fillmore soils are examples.

Soils in depressions are poorly drained and are characterized by a clayey subsoil that shows evidence of strong soil development. Fillmore and Scott soils, for example, formed in upland depressions.

Soils at the lowest elevations on the Platte River bottom lands have a high water table. These soils are poorly drained or somewhat poorly drained. Organic matter decomposes more slowly in these soils than in well drained soils. Capillary action carries salts to or near the surface. When the water evaporates, the salts remain, making the soil saline or alkaline. Mottling is common in poorly drained soils. Runoff is slow. Alda, Boel, Gibbon, and Ovina soils are somewhat poorly drained soils on bottom lands.

time

Time is needed for a soil to form from parent material. A considerable length of time is required for the development of a mature soil that has genetic horizons. The longer parent material is exposed to weathering and other agents of soil development, the more nearly the soil profile will be in equilibrium with its environment. The length of time required for a particular soil to form depends on the other factors involved.

Some soils in Butler County have not developed soil horizons. Steep soils constantly lose soil material by erosion, and new material is exposed to weathering. The steeply sloping Coly soils, for example, have minimal horizon development. Hobbs soils, which formed in recently deposited alluvial sediment, have weakly developed horizons. Hastings and Sharpsburg soils have been in place long enough for well defined, genetically related horizons to form.

Many centuries are required for soils to become mature and to develop genetically related horizons, but a dark surface layer forms under grassland vegetation in less than 100 years. Soil development in mature soils of Butler County has mainly taken place during the last 10,000 to 15,000 years.

references

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Condra, G.E., E.C. Reed, and E.D. Gordon. 1950. Correlation of the Pleistocene deposits of Nebraska. Nebr. Geol. Surv. Bull. 15A, 74 pp., illus.

(4) Condra, G.E. and E.C. Reed. 1959. The geological section of Nebraska. Univ. Nebr. Conserv. & Surv. Div., Nebr. Geol. Surv. Bull. 14A, 82 pp., illus.

(5) United States Department of Agriculture. 1929. Soil survey of Butler County, Nebraska. Bureau of Chemistry and Soils. 36 pp.

(6) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]

(7) United States Department of Agriculture. 1971. Irrigation guide for Nebraska. Soil Conserv. Serv.

(8) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth, soil. The total thickness of weathered soil material over bedrock. In this survey the classes of soil depth are very shallow, 0 to 10 inches; shallow, 10 to 20 inches; moderately deep, 20 to 40 inches; and deep, more than 40 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the

activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Organic matter content. The amount of organic matter in soil material. The classes used in this survey are very low, less than 0.5 percent; low, 0.5 to 1.0 percent; moderately low, 1.0 to 2.0 percent; moderate, 2.0 to 4.0 percent; and high, 4.0 to 8.0 percent.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002

millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use. In this survey, the classes of slope are:

nearly level	0 to 1 percent
very gently sloping	1 to 3 percent
gently sloping	2 to 6 percent
strongly sloping	6 to 11 percent
moderately steep	11 to 17 percent
steep	17 to 30 percent
very steep	30 to 75 percent

Slow intake (in tables). The slow movement of water into the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-76 at David City, Nebraska]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	31.6	10.6	21.1	59	-18	0	.74	.28	1.10	2	8.7
February---	38.4	16.8	27.6	68	-12	0	1.14	.29	1.81	3	6.4
March------	47.1	24.9	36.0	79	-3	37	1.88	.80	2.74	5	7.0
April------	63.1	38.3	50.7	88	17	111	2.55	1.42	3.47	6	.6
May--------	74.3	49.6	62.0	94	30	378	4.55	2.22	6.45	8	.0
June-------	84.0	59.5	71.8	101	42	654	5.08	2.01	7.55	8	.0
July-------	89.2	64.4	76.8	102	50	831	2.70	1.15	3.95	6	.0
August-----	86.8	62.6	74.7	100	49	766	3.18	1.51	4.53	6	.0
September--	77.2	52.8	65.0	97	32	450	3.27	1.36	4.80	6	.0
October----	67.1	41.7	54.4	89	22	204	1.73	.31	2.82	4	.0
November---	49.7	27.4	38.6	75	3	9	1.08	.19	1.76	2	2.2
December---	36.8	16.6	26.7	64	-12	0	.89	.23	1.40	2	6.1
Yearly:											
Average--	62.1	38.8	50.5	---	---	---	---	---	---	---	---
Extreme--	---	---	---	103	-20	---	---	---	---	---	---
Total----	---	---	---	---	---	3,440	28.79	21.50	35.55	58	31.0

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-76 at David City, Nebraska]

Probability	Temperature 24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 19	May 3	May 13
2 years in 10 later than--	April 15	April 28	May 7
5 years in 10 later than--	April 6	April 18	April 27
First freezing temperature in fall:			
1 year in 10 earlier than--	October 19	October 7	September 26
2 years in 10 earlier than--	October 23	October 12	October 1
5 years in 10 earlier than--	October 31	October 21	October 11

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-76 at David City, Nebraska]

Probability	Length of growing season if daily minimum temperature is-- Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	189	167	144
8 years in 10	195	173	152
5 years in 10	207	185	166
2 years in 10	219	197	181
1 year in 10	225	203	189

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Af	Alda fine sandy loam, 0 to 2 percent slopes	1,790	0.5
Ba	Barney loam, 0 to 2 percent slopes	2,140	0.6
Bd	Blendon fine sandy loam, 0 to 2 percent slopes	1,350	0.4
BdC	Blendon fine sandy loam, 2 to 6 percent slopes	240	0.1
Bf	Blendon-Muir complex, 0 to 2 percent slopes	3,920	1.1
Bh	Boel loam, 0 to 2 percent slopes	990	0.3
Bn	Boel-Alda complex, 0 to 2 percent slopes	2,290	0.6
Br	Brocksburg sandy loam, 0 to 2 percent slopes	1,740	0.5
BsD	Burchard loam, 6 to 11 percent slopes	2,240	0.6
BsE	Burchard loam, 11 to 15 percent slopes	1,270	0.3
BtE2	Burchard-Steinauer clay loams, 11 to 15 percent slopes, eroded	2,220	0.6
Bu	Butler silt loam, 0 to 1 percent slopes	15,590	4.2
CfG	Coly silt loam, 30 to 60 percent slopes	1,260	0.3
CoB	Cozad silt loam, 1 to 3 percent slopes	2,380	0.6
CrD2	Crofton silt loam, 6 to 11 percent slopes, eroded	600	0.2
CrE2	Crofton silt loam, 11 to 17 percent slopes, eroded	5,130	1.4
CrF2	Crofton silt loam, 17 to 30 percent slopes, eroded	700	0.2
CrG	Crofton silt loam, 30 to 60 percent slopes	1,180	0.3
Fm	Fillmore silt loam, 0 to 1 percent slopes	8,530	2.3
Gb	Gibbon silty clay loam, 0 to 2 percent slopes	7,180	1.9
Gr	Grigston silt loam, 0 to 1 percent slopes	3,780	1.0
Ha	Hall silt loam, 0 to 1 percent slopes	2,250	0.6
Hc	Hastings silt loam, 0 to 1 percent slopes	76,920	20.7
HcB	Hastings silt loam, 1 to 3 percent slopes	23,500	6.3
HcC	Hastings silt loam, 3 to 6 percent slopes	1,830	0.5
HcD	Hastings silt loam, 6 to 11 percent slopes	390	0.1
HdC2	Hastings silty clay loam, 3 to 6 percent slopes, eroded	8,730	2.3
HdD2	Hastings silty clay loam, 6 to 11 percent slopes, eroded	27,480	7.4
Hg	Hobbs silt loam, 0 to 1 percent slopes	11,840	3.2
HhB	Hobbs silt loam, channeled, 0 to 3 percent slopes	5,740	1.5
HkB	Holder silt loam, 1 to 3 percent slopes	1,820	0.5
IvC	Inavale loamy sand, 2 to 6 percent slopes	1,190	0.3
IwC	Inavale-Boel complex, 0 to 6 percent slopes	600	0.2
JuC	Judson silt loam, 2 to 6 percent slopes	8,030	2.1
Kz	Kezan silt loam, 0 to 2 percent slopes	6,560	1.8
La	Lamo silty clay loam, 0 to 2 percent slopes	1,330	0.4
LoC2	Longford silty clay loam, 2 to 6 percent slopes, eroded	460	0.1
LoD2	Longford silty clay loam, 6 to 11 percent slopes, eroded	870	0.2
MnC	Monona silt loam, 2 to 6 percent slopes	880	0.2
MnD2	Monona silt loam, 6 to 11 percent slopes, eroded	1,690	0.5
MnE	Monona silt loam, 11 to 17 percent slopes	740	0.2
MnF	Monona silt loam, 17 to 30 percent slopes	4,380	1.2
Mu	Muir silt loam, 0 to 1 percent slopes	14,360	3.9
MuB	Muir silt loam, 1 to 3 percent slopes	4,510	1.2
Ob	Olbut-Butler silt loams, 0 to 1 percent slopes	4,660	1.3
OvB	Ovina loamy fine sand, 0 to 3 percent slopes	2,130	0.6
OxC	Ovina-Thurman loamy fine sands, 0 to 6 percent slopes	2,690	0.7
PaC2	Pawnee clay loam, 3 to 6 percent slopes, eroded	620	0.2
PaD2	Pawnee clay loam, 6 to 11 percent slopes, eroded	5,670	1.5
Pg	Pits, gravel	480	0.1
PoC2	Ponca silty clay loam, 2 to 6 percent slopes, eroded	750	0.2
PoD2	Ponca silty clay loam, 6 to 11 percent slopes, eroded	6,620	1.8
PoE2	Ponca silty clay loam, 11 to 17 percent slopes, eroded	7,520	2.0
PsD2	Ponca-Crofton complex, 6 to 11 percent slopes, eroded	1,790	0.5
PsE2	Ponca-Crofton complex, 11 to 17 percent slopes, eroded	7,870	2.1
PsF2	Ponca-Crofton complex, 17 to 30 percent slopes, eroded	850	0.2
Sa	Saltine-Gibbon silt loams, 0 to 1 percent slopes	3,060	0.8
Sc	Scott silt loam, 0 to 1 percent slopes	1,040	0.3
Sh	Sharpsburg silty clay loam, 0 to 2 percent slopes	490	0.1
ShC	Sharpsburg silty clay loam, 2 to 6 percent slopes	4,100	1.1
ShC2	Sharpsburg silty clay loam, 2 to 6 percent slopes, eroded	8,330	2.2
ShD	Sharpsburg silty clay loam, 6 to 11 percent slopes	520	0.1
ShD2	Sharpsburg silty clay loam, 6 to 11 percent slopes, eroded	7,270	2.0
Sk	Silver Creek complex, 0 to 2 percent slopes	720	0.2
SmB	Simeon loamy sand, 0 to 3 percent slopes	1,290	0.3
StD2	Steinauer clay loam, 6 to 11 percent slopes, eroded	910	0.2
StF	Steinauer clay loam, 11 to 30 percent slopes	3,520	0.9
StG	Steinauer clay loam, 30 to 50 percent slopes	3,130	0.8
ThC	Thurman loamy fine sand, 3 to 6 percent slopes	2,920	0.8
TkD	Thurman-Monona complex, 6 to 11 percent slopes	600	0.2

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
UaF2	Uly silt loam, 11 to 15 percent slopes, eroded	1,250	0.3
UbF	Uly-Coly silt loams, 15 to 30 percent slopes	2,540	0.7
UcF2	Uly-Coly silt loams, 15 to 25 percent slopes, eroded	4,210	1.1
UhF2	Uly-Hobbs silt loams, 0 to 30 percent slopes, eroded	4,190	1.1
UkC2	Uly Variant silty clay loam, 3 to 6 percent slopes, eroded	840	0.2
WoB	Wood River silt loam, 1 to 3 percent slopes	710	0.2
Zk	Zook silt loam, overwash, 0 to 2 percent slopes	2,580	0.7
Zo	Zook silty clay loam, 0 to 2 percent slopes	3,780	1.0
	Water areas less than 40 acres in size	210	0.1
	Total	372,480	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn		Grain sorghum		Winter wheat		Soybeans		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Bu	Bu	Bu	Bu	Ton	Ton
Af----------------------- Alda	60	125	65	110	30	---	28	38	2.8	5.0
Ba----------------------- Barney	---	---	---	---	---	---	---	---	---	---
Bd, BdC------------------ Blendon	65	135	60	115	35	---	30	40	2.8	5.8
Bf----------------------- Blendon-Muir	70	140	65	120	40	---	32	42	3.0	6.0
Bh----------------------- Boel	40	115	45	95	26	---	---	---	2.7	4.5
Bn----------------------- Boel-Alda	49	119	54	102	28	---	---	---	2.8	4.8
Br----------------------- Brocksburg	34	130	44	110	27	---	25	40	1.8	5.3
BsD---------------------- Burchard	58	90	65	90	30	---	22	34	2.8	5.0
BsE---------------------- Burchard	45	---	48	---	23	---	---	---	2.5	---
BtE2--------------------- Burchard-Steinauer	40	---	42	---	20	---	---	---	2.2	---
Bu----------------------- Butler	62	130	75	120	38	---	31	40	3.8	6.0
CfG---------------------- Coly	---	---	---	---	---	---	---	---	---	---
CoB---------------------- Cozad	78	140	83	120	42	---	32	40	3.5	6.0
CrD2--------------------- Crofton	53	85	45	50	24	---	---	---	2.3	4.5
CrE2--------------------- Crofton	40	---	38	---	24	---	---	---	2.0	---
CrF2--------------------- Crofton	---	---	---	---	---	---	---	---	---	---
CrG---------------------- Crofton	---	---	---	---	---	---	---	---	---	---
Fm----------------------- Fillmore	50	105	60	110	30	---	---	---	2.8	4.5
Gb----------------------- Gibbon	80	130	85	120	37	---	34	42	4.5	6.0
Gr----------------------- Grigston	90	145	85	125	45	---	38	48	4.2	6.5
Ha----------------------- Hall	85	145	85	125	45	---	36	48	3.9	6.5
Hc----------------------- Hastings	81	145	85	125	45	---	34	45	3.8	6.5

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn		Grain sorghum		Winter wheat		Soybeans		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Bu	Bu	Bu	Bu	Ton	Ton
HcB----------------------- Hastings	78	135	80	120	40	---	30	42	3.6	6.2
HcC----------------------- Hastings	70	130	77	115	38	---	28	41	3.4	6.0
HcD----------------------- Hastings	68	115	71	100	33	---	24	34	3.0	5.5
HdC2---------------------- Hastings	66	120	72	110	34	---	26	---	3.2	5.8
HdD2---------------------- Hastings	63	105	66	95	28	---	---	---	2.8	5.0
Hg------------------------ Hobbs	82	140	86	120	42	---	35	45	4.5	6.5
HhB----------------------- Hobbs	---	---	---	---	---	---	---	---	---	---
HkB----------------------- Holder	79	140	83	120	42	---	32	45	3.8	6.2
IvC----------------------- Inavale	---	100	---	80	---	---	---	---	---	3.8
IwC----------------------- Inavale-Boel	---	90	42	75	---	---	---	---	---	3.5
JuC----------------------- Judson	80	135	87	120	43	---	34	42	4.0	6.2
Kz------------------------ Kezan	32	---	34	---	---	---	---	---	3.0	---
La------------------------ Lamo	78	115	78	105	34	---	32	40	3.8	5.8
LoC2---------------------- Longford	58	---	68	---	30	---	20	---	2.6	---
LoD2---------------------- Longford	45	---	55	---	25	---	---	---	2.0	---
MnC----------------------- Monona	75	130	85	115	37	---	30	38	3.8	6.0
MnD2---------------------- Monona	60	115	72	105	33	---	25	---	3.4	5.5
MnE----------------------- Monona	58	---	65	---	27	---	---	---	3.0	---
MnF----------------------- Monona	---	---	---	---	---	---	---	---	---	---
Mu------------------------ Muir	90	145	90	130	48	---	40	50	4.5	6.5
MuB----------------------- Muir	82	140	85	125	43	---	33	42	4.0	6.2
Ob------------------------ Olbut-Butler	48	85	55	80	25	---	---	---	2.8	4.5
OvB----------------------- Ovina	55	125	55	105	25	---	---	---	3.2	5.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn		Grain sorghum		Winter wheat		Soybeans		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Bu	Bu	Bu	Bu	Ton	Ton
OxC----------------------- Ovina-Thurman	50	115	50	100	22	---	---	---	2.5	4.8
PaC2---------------------- Pawnee	56	---	68	---	32	---	25	---	2.4	4.5
PaD2---------------------- Pawnee	48	---	60	---	25	---	---	---	2.0	4.0
Pg*. Pits										
PoC2---------------------- Ponca	70	120	75	115	38	---	30	38	3.8	6.0
PoD2---------------------- Ponca	62	110	65	100	32	---	---	---	3.2	5.5
PoE2---------------------- Ponca	55	---	60	---	27	---	---	---	3.0	---
PsD2---------------------- Ponca-Crofton	58	100	62	---	28	---	---	---	2.9	5.0
PsE2---------------------- Ponca-Crofton	53	---	55	---	24	---	---	---	2.4	---
PsF2---------------------- Ponca-Crofton	---	---	---	---	---	---	---	---	---	---
Sa------------------------ Saltine-Gibbon	49	80	53	75	26	---	20	---	3.2	4.5
Sc------------------------ Scott	---	---	30	---	18	---	---	---	---	---
Sh------------------------ Sharpsburg	83	145	88	125	43	---	38	45	4.2	6.5
ShC----------------------- Sharpsburg	78	130	84	115	46	---	32	40	4.0	6.0
ShC2---------------------- Sharpsburg	70	125	76	110	38	---	30	---	3.8	5.8
ShD----------------------- Sharpsburg	68	115	75	105	35	---	27	---	3.5	5.7
ShD2---------------------- Sharpsburg	66	110	72	100	33	---	23	---	3.3	5.5
Sk------------------------ Silver Creek	40	---	55	---	28	---	21	---	1.7	3.5
SmB----------------------- Simeon	---	110	28	90	---	---	---	---	1.4	4.0
StD2---------------------- Steinauer	---	---	40	---	24	---	---	---	2.2	---
StF----------------------- Steinauer	---	---	---	---	---	---	---	---	---	---
StG----------------------- Steinauer	---	---	---	---	---	---	---	---	---	---
ThC----------------------- Thurman	50	95	50	90	25	---	---	---	1.8	4.0

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn		Grain sorghum		Winter wheat		Soybeans		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Bu	Bu	Bu	Bu	Ton	Ton
TkD---------------------- Thurman-Monona	48	90	---	---	23	---	---	---	2.0	4.4
UaF2--------------------- Uly	---	---	---	---	---	---	---	---	---	---
UbF, UcF2---------------- Uly-Coly	---	---	---	---	---	---	---	---	---	---
UhF2--------------------- Uly-Hobbs	---	---	---	---	---	---	---	---	---	---
UkC2--------------------- Uly Variant	41	80	52	77	25	---	---	---	2.5	4.8
WoB---------------------- Wood River	40	115	49	105	28	---	---	---	2.8	5.2
Zk----------------------- Zook	84	125	82	115	38	---	36	45	4.4	6.0
Zo----------------------- Zook	78	120	78	110	35	---	32	42	3.8	6.0

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[All soils are assigned to nonirrigated capability subclasses (N). Only potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I (N)	97,800	---	---	---	---
(I)	97,800	---	---	---	---
II (N)	93,540	45,970	42,300	5,270	---
(I)	79,780	32,210	42,300	5,270	---
III (N)	65,860	42,410	15,730	7,720	---
(I)	61,480	35,580	15,730	10,170	---
IV (N)	76,420	64,810	7,600	4,010	---
(I)	56,910	54,180	600	2,130	---
V (N)	2,140	---	2,140	---	---
VI (N)	30,460	22,830	6,340	1,290	---
VII (N)	5,570	5,570	---	---	---
VIII(N)	480	---	---	480	---

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
Af: Alda	Subirrigated	Favorable	5,300	Big bluestem	30
		Normal	5,000	Little bluestem	10
		Unfavorable	4,200	Switchgrass	10
				Indiangrass	10
				Prairie cordgrass	5
				Western wheatgrass	5
				Sedge	5
Bd, BdC: Blendon	Sandy	Favorable	4,000	Little bluestem	25
		Normal	3,300	Big bluestem	20
		Unfavorable	2,300	Prairie sandreed	15
				Needleandthread	10
				Porcupinegrass	10
				Blue grama	5
				Leadplant	5
				Sedge	5
Bf*:					
Blendon	Sandy	Favorable	4,000	Little bluestem	25
		Normal	3,300	Big bluestem	20
		Unfavorable	2,300	Prairie sandreed	15
				Needleandthread	10
				Porcupinegrass	10
				Blue grama	5
				Leadplant	5
				Sedge	5
Muir	Silty Lowland	Favorable	5,000	Big bluestem	30
		Normal	4,300	Indiangrass	15
		Unfavorable	3,500	Switchgrass	10
				Little bluestem	5
				Tall dropseed	5
				Prairie cordgrass	5
Bh: Boel	Subirrigated	Favorable	5,000	Big bluestem	30
		Normal	4,500	Indiangrass	15
		Unfavorable	3,700	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	5
Bn*:					
Boel	Subirrigated	Favorable	5,000	Big bluestem	30
		Normal	4,500	Indiangrass	15
		Unfavorable	3,700	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	5
Alda	Subirrigated	Favorable	5,300	Big bluestem	30
		Normal	5,000	Little bluestem	10
		Unfavorable	4,200	Switchgrass	10
				Indiangrass	10
				Prairie cordgrass	5
				Western wheatgrass	5
				Sedge	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
Br: Brocksburg	Sandy	Favorable	3,500	Little bluestem	25
		Normal	3,000	Big bluestem	15
		Unfavorable	2,500	Prairie sandreed	15
				Blue grama	10
				Needleandthread	10
				Switchgrass	5
				Sedge	5
				Leadplant	5
BsD, BsE: Burchard	Silty	Favorable	4,000	Big bluestem	30
		Normal	3,500	Little bluestem	20
		Unfavorable	2,500	Indiangrass	10
				Switchgrass	10
				Sideoats grama	10
				Prairie dropseed	5
				Sedge	5
BtE2*:					
Burchard	Silty	Favorable	4,000	Big bluestem	30
		Normal	3,500	Little bluestem	20
		Unfavorable	2,500	Indiangrass	10
				Switchgrass	10
				Sideoats grama	10
				Prairie dropseed	5
				Sedge	5
Steinauer	Limy Upland	Favorable	3,500	Little bluestem	35
		Normal	2,500	Big bluestem	15
		Unfavorable	2,000	Sideoats grama	10
				Indiangrass	8
				Prairie junegrass	6
				Tall dropseed	5
				Kentucky bluegrass	5
Bu: Butler	Clayey	Favorable	4,500	Little bluestem	25
		Normal	3,500	Big bluestem	20
		Unfavorable	2,200	Switchgrass	12
				Tall dropseed	5
				Sedge	5
CfG: Coly	Thin Loess	Favorable	3,300	Little bluestem	30
		Normal	2,800	Sideoats grama	15
		Unfavorable	1,700	Big bluestem	10
				Plains muhly	10
				Blue grama	10
				Western wheatgrass	5
				Sedge	5
CoB: Cozad	Silty Lowland	Favorable	4,500	Big bluestem	35
		Normal	3,500	Little bluestem	15
		Unfavorable	2,500	Switchgrass	15
				Indiangrass	5
				Sideoats grama	5
				Green muhly	5
				Sedge	5
				Western wheatgrass	5
CrD2, CrE2, CrF2: Crofton	Limy Upland	Favorable	4,000	Little bluestem	40
		Normal	3,300	Big bluestem	20
		Unfavorable	2,200	Sideoats grama	5
				Blue grama	5
				Western wheatgrass	5
				Sedge	5
				Leadplant	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
CrG: Crofton	Thin Loess	Favorable	4,000	Little bluestem	45
		Normal	3,300	Big bluestem	15
		Unfavorable	2,200	Sideoats grama	10
				Blue grama	5
				Western wheatgrass	5
				Switchgrass	5
				Indiangrass	5
Fm: Fillmore	Clayey Overflow	Favorable	4,000	Big bluestem	20
		Normal	3,250	Western wheatgrass	20
		Unfavorable	2,500	Switchgrass	15
				Little bluestem	10
				Blue grama	10
				Indiangrass	5
				Canada wildrye	5
				Buffalograss	5
				Sedge	5
				Kentucky bluegrass	5
Gb: Gibbon	Subirrigated	Favorable	5,500	Big bluestem	30
		Normal	5,000	Indiangrass	15
		Unfavorable	4,500	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	10
				Kentucky bluegrass	5
Gr: Grigston	Silty Lowland	Favorable	5,000	Big bluestem	30
		Normal	4,300	Western wheatgrass	15
		Unfavorable	3,200	Switchgrass	10
				Little bluestem	10
				Sideoats grama	10
				Indiangrass	5
				Maximilian sunflower	5
				Sedge	5
Ha: Hall	Silty Lowland	Favorable	4,800	Big bluestem	35
		Normal	4,000	Little bluestem	10
		Unfavorable	3,000	Switchgrass	10
				Indiangrass	10
				Western wheatgrass	10
				Canada wildrye	5
				Sedge	5
				Needleandthread	5
Hc, HcB, HcC, HcD, HdC2, HdD2: Hastings	Silty	Favorable	4,100	Big bluestem	25
		Normal	3,100	Little bluestem	20
		Unfavorable	2,000	Sideoats grama	15
				Blue grama	10
				Western wheatgrass	10
				Switchgrass	5
				Buffalograss	5
Hg, HhB: Hobbs	Silty Overflow	Favorable	5,000	Big bluestem	30
		Normal	4,500	Western wheatgrass	12
		Unfavorable	3,500	Switchgrass	10
				Indiangrass	7
				Little bluestem	6
				Sideoats grama	5
				Tall dropseed	5
				Maximilian sunflower	5
				Wholeleaf rosinweed	5
				Sedge	5
				Blue grama	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
HkB: Holder	Silty	Favorable	4,300	Big bluestem	22
		Normal	3,300	Little bluestem	18
		Unfavorable	2,200	Sideoats grama	15
				Blue grama	10
				Western wheatgrass	10
				Buffalograss	5
				Sand dropseed	5
				Sedge	5
IvC: Inavale	Sandy Lowland	Favorable	4,000	Little bluestem	25
		Normal	3,300	Sand bluestem	20
		Unfavorable	2,500	Needleandthread	15
				Prairie sandreed	15
				Switchgrass	5
				Blue grama	5
				Sand dropseed	5
IwC*:					
Inavale	Sandy Lowland	Favorable	4,000	Little bluestem	25
		Normal	3,300	Sand bluestem	20
		Unfavorable	2,500	Needleandthread	15
				Prairie sandreed	15
				Switchgrass	5
				Blue grama	5
				Sand dropseed	5
Boel	Subirrigated	Favorable	5,000	Big bluestem	30
		Normal	4,500	Indiangrass	15
		Unfavorable	3,700	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	5
JuC: Judson	Silty	Favorable	4,500	Big bluestem	30
		Normal	4,000	Switchgrass	10
		Unfavorable	3,000	Little bluestem	10
				Indiangrass	7
				Porcupinegrass	5
				Western wheatgrass	5
				Sideoats grama	5
				Kentucky bluegrass	5
				Tall dropseed	5
				Sedge	5
Kz: Kezan	Subirrigated	Favorable	6,000	Big bluestem	25
		Normal	5,500	Little bluestem	15
		Unfavorable	4,500	Switchgrass	10
				Indiangrass	10
				Prairie cordgrass	10
				Kentucky bluegrass	10
				Sedge	5
La: Lamo	Subirrigated	Favorable	6,300	Big bluestem	30
		Normal	5,800	Little bluestem	10
		Unfavorable	4,500	Indiangrass	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	10
				Canada wildrye	5
				Kentucky bluegrass	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
LoC2, LoD2: Longford	Clayey	Favorable	4,500	Big bluestem	25
		Normal	3,800	Little bluestem	20
		Unfavorable	2,700	Indiangrass	10
				Switchgrass	10
				Sideoats grama	5
				Tall dropseed	5
				Blue grama	5
				Western wheatgrass	5
				Leadplant	5
				Missouri goldenrod	5
MnC, MnD2, MnE, MnF: Monona	Silty	Favorable	4,500	Big bluestem	30
		Normal	4,000	Switchgrass	10
		Unfavorable	3,000	Little bluestem	10
				Indiangrass	7
				Porcupinegrass	5
				Western wheatgrass	5
				Sideoats grama	5
				Kentucky bluegrass	5
				Tall dropseed	5
				Sedge	5
Mu, MuB: Muir	Silty Lowland	Favorable	5,000	Big bluestem	30
		Normal	4,300	Indiangrass	15
		Unfavorable	3,500	Switchgrass	10
				Little bluestem	5
				Tall dropseed	5
				Prairie cordgrass	5
Ob*:					
Olbut	Saline Lowland	Favorable	3,500	Switchgrass	25
		Normal	3,000	Western wheatgrass	20
		Unfavorable	2,200	Indiangrass	10
				Inland saltgrass	10
				Blue grama	10
				Big bluestem	5
				Sedge	5
Butler	Clayey	Favorable	4,500	Little bluestem	25
		Normal	3,800	Big bluestem	20
		Unfavorable	2,500	Switchgrass	12
				Tall dropseed	5
				Sedge	5
OvB: Ovina	Subirrigated	Favorable	5,700	Big bluestem	25
		Normal	5,000	Little bluestem	15
		Unfavorable	4,200	Indiangrass	10
				Switchgrass	10
				Prairie cordgrass	10
				Canada wildrye	5
				Kentucky bluegrass	5
OxC*:					
Ovina	Subirrigated	Favorable	5,700	Big bluestem	25
		Normal	5,000	Little bluestem	15
		Unfavorable	4,200	Indiangrass	10
				Switchgrass	10
				Prairie cordgrass	10
				Canada wildrye	5
				Kentucky bluegrass	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
OxC*:					
Thurman	Sandy	Favorable	3,800	Little bluestem	25
		Normal	3,300	Sand bluestem	20
		Unfavorable	2,500	Prairie sandreed	15
				Needleandthread	10
				Switchgrass	5
				Blue grama	5
				Sedge	5
PaC2, PaD2 Pawnee	Dense Clay	Favorable	4,500	Big bluestem	30
		Normal	3,500	Little bluestem	20
		Unfavorable	2,200	Switchgrass	10
				Tall dropseed	5
				Sideoats grama	5
				Scribner panicum	5
				Kentucky bluegrass	5
PoC2, PoD2, PoE2 Ponca	Silty	Favorable	4,500	Big bluestem	20
		Normal	3,800	Little bluestem	15
		Unfavorable	2,700	Sideoats grama	10
				Porcupinegrass	10
				Switchgrass	5
				Indiangrass	5
				Tall dropseed	5
				Blue grama	5
				Sedge	5
				Western wheatgrass	5
PsD2*, PsE2*, PsF2*:					
Ponca	Silty	Favorable	4,500	Big bluestem	20
		Normal	3,800	Little bluestem	15
		Unfavorable	2,700	Sideoats grama	10
				Porcupinegrass	10
				Switchgrass	5
				Indiangrass	5
				Tall dropseed	5
				Blue grama	5
				Sedge	5
				Western wheatgrass	5
Crofton	Limy Upland	Favorable	4,000	Little bluestem	40
		Normal	3,300	Big bluestem	20
		Unfavorable	2,200	Sideoats grama	5
				Blue grama	5
				Western wheatgrass	5
				Sedge	5
				Leadplant	5
Sa*:					
Saltine	Saline Subirrigated	Favorable	4,500	Switchgrass	20
		Normal	3,800	Western wheatgrass	20
		Unfavorable	2,500	Indiangrass	10
				Inland saltgrass	10
				Sedge	10
				Blue grama	10
				Canada wildrye	5
				Buffalograss	5
Gibbon	Subirrigated	Favorable	5,500	Big bluestem	30
		Normal	5,000	Indiangrass	15
		Unfavorable	4,500	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	10
				Kentucky bluegrass	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
Sk*: Silver Creek	Saline Subirrigated	Favorable	4,300	Alkali sacaton	30
		Normal	3,800	Inland saltgrass	15
		Unfavorable	3,000	Western wheatgrass	15
				Indiangrass	5
				Plains bluegrass	5
				Sedge	5
				Rush	5
SmB: Simeon	Sands	Favorable	3,500	Blue grama	20
		Normal	2,800	Sand bluestem	15
		Unfavorable	2,000	Prairie sandreed	10
				Needleandthread	10
				Hairy grama	5
				Little bluestem	5
				Sand dropseed	5
				Sedge	5
				Leadplant	5
				Clubmoss	5
StD2, StF, StG: Steinauer	Limy Upland	Favorable	3,500	Little bluestem	35
		Normal	2,500	Big bluestem	15
		Unfavorable	2,000	Sideoats grama	10
				Indiangrass	8
				Prairie junegrass	6
				Tall dropseed	5
				Kentucky bluegrass	5
ThC: Thurman	Sandy	Favorable	3,800	Little bluestem	25
		Normal	3,300	Sand bluestem	20
		Unfavorable	2,500	Prairie sandreed	15
				Needleandthread	10
				Switchgrass	5
				Blue grama	5
				Sedge	5
TkD*:					
Thurman	Sandy	Favorable	3,800	Little bluestem	25
		Normal	3,300	Sand bluestem	20
		Unfavorable	2,500	Prairie sandreed	15
				Needleandthread	10
				Switchgrass	5
				Blue grama	5
				Sedge	5
Monona	Silty	Favorable	4,500	Big bluestem	30
		Normal	4,000	Switchgrass	10
		Unfavorable	3,000	Little bluestem	10
				Indiangrass	7
				Porcupinegrass	5
				Western wheatgrass	5
				Sideoats grama	5
				Kentucky bluegrass	5
				Tall dropseed	5
				Sedge	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
UaF2: Uly	Silty	Favorable	3,800	Big bluestem	35
		Normal	3,000	Little bluestem	25
		Unfavorable	2,200	Western wheatgrass	12
				Blue grama	6
				Sedge	5
UbF*, UcF2*:					
Uly	Silty	Favorable	3,800	Big bluestem	35
		Normal	3,000	Little bluestem	25
		Unfavorable	2,200	Western wheatgrass	12
				Blue grama	6
				Sedge	5
Coly	Limy Upland	Favorable	3,300	Little bluestem	25
		Normal	2,800	Big bluestem	20
		Unfavorable	1,700	Blue grama	15
				Sideoats grama	10
				Plains muhly	5
				Western wheatgrass	5
				Sedge	5
UhF2*:					
Uly	Silty	Favorable	3,800		
		Normal	3,000		
		Unfavorable	2,200		
Hobbs	Silty Overflow	Favorable	5,000	Big bluestem	30
		Normal	4,500	Western wheatgrass	12
		Unfavorable	3,500	Switchgrass	10
				Indiangrass	7
				Little bluestem	6
				Sideoats grama	5
				Tall dropseed	5
				Maximilian sunflower	5
				Wholeleaf rosinweed	5
				Sedge	5
				Blue grama	5
UkC2: Uly Variant	Saline Lowland	Favorable	3,500	Western wheatgrass	30
		Normal	3,000	Inland saltgrass	20
		Unfavorable	2,200	Switchgrass	10
				Slender wheatgrass	5
				Indiangrass	5
				Blue grama	5
				Tall dropseed	5
				Kentucky bluegrass	5
				Sedge	5
WoB: Wood River	Saline Lowland	Favorable	3,500	Big bluestem	25
		Normal	3,000	Little bluestem	15
		Unfavorable	2,200	Switchgrass	10
				Sideoats grama	10
				Western wheatgrass	10
				Indiangrass	5
				Tall dropseed	5
				Blue grama	5
				Sedge	5
Zk, Zo: Zook	Clayey Overflow	Favorable	4,000	Big bluestem	30
		Normal	3,500	Indiangrass	15
		Unfavorable	2,500	Switchgrass	10
				Prairie cordgrass	10
				Little bluestem	5
				Sedge	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Af: Alda	American plum, redosier dogwood.	Common chokecherry	Eastern redcedar	Austrian pine, Scotch pine, Russian mulberry, green ash, honeylocust, silver maple, golden willow.	Eastern cottonwood.
Ba: Barney	Redosier dogwood	---	---	Golden willow	Eastern cottonwood.
Bd, BdC: Blendon	---	Eastern redcedar, Tatarian honeysuckle, Siberian peashrub, lilac, American plum.	Green ash, common hackberry, ponderosa pine, Russian-olive, Siberian crabapple.	Siberian elm, honeylocust.	---
Bf*:					
Blendon	---	Eastern redcedar, Tatarian honeysuckle, Siberian peashrub, lilac, American plum.	Green ash, common hackberry, ponderosa pine, Russian-olive, Siberian crabapple.	Siberian elm, honeylocust.	---
Muir	American plum	Peking cotoneaster, Amur honeysuckle, autumn-olive.	Bur oak, eastern redcedar, common hackberry, midwest Manchurian crabapple.	Scotch pine, honeylocust, Austrian pine, green ash.	---
Bh: Boel	Redosier dogwood, American plum.	Common chokecherry	Eastern redcedar	Austrian pine, Russian mulberry, green ash, honeylocust, golden willow, Scotch pine, silver maple.	Eastern cottonwood.
Bn*:					
Boel	Redosier dogwood, American plum.	Common chokecherry	Eastern redcedar	Austrian pine, Russian mulberry, green ash, honeylocust, golden willow, Scotch pine, silver maple.	Eastern cottonwood.
Alda	American plum, redosier dogwood.	Common chokecherry	Eastern redcedar	Austrian pine, Scotch pine, Russian mulberry, green ash, honeylocust, silver maple, golden willow.	Eastern cottonwood.
Br: Brocksburg	Skunkbush sumac, Peking cotoneaster, Tatarian honeysuckle.	Eastern redcedar	Austrian pine, ponderosa pine, honeylocust, bur oak, Russian-olive, common hackberry.	Siberian elm	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
BsD, BsE: Burchard	Peking cotoneaster, lilac.	Amur honeysuckle, skunkbush sumac.	Eastern redcedar, Russian mulberry, green ash, common hackberry, bur oak.	Austrian pine, Scotch pine, honeylocust.	---
BtE2*:					
Burchard	Peking cotoneaster, lilac.	Amur honeysuckle, skunkbush sumac.	Eastern redcedar, Russian mulberry, green ash, common hackberry, bur oak.	Austrian pine, Scotch pine, honeylocust.	---
Steinauer	Skunkbush sumac, Peking cotoneaster, Tatarian honeysuckle.	Russian-olive	Eastern redcedar, ponderosa pine, Austrian pine, bur oak, Scotch pine, honeylocust, common hackberry, green ash.	---	---
Bu: Butler	American plum, redosier dogwood.	Common chokecherry	Eastern redcedar	Austrian pine, Scotch pine, Russian mulberry, green ash, honeylocust, silver maple, golden willow.	Eastern cottonwood.
CfG. Coly					
CoB: Cozad	American plum	Amur maple, lilac, Peking cotoneaster, Amur honeysuckle.	Eastern redcedar, bur oak.	Austrian pine, Scotch pine, green ash, common hackberry, honeylocust.	---
CrD2, CrE2, CrF2, CrG: Crofton	Skunkbush sumac, Peking cotoneaster, Tatarian honeysuckle.	Russian-olive	Eastern redcedar, Austrian pine, ponderosa pine, Scotch pine, honeylocust, bur oak, green ash, common hackberry.	---	---
Fm: Fillmore	Redosier dogwood	Common chokecherry, American plum.	Eastern redcedar, Austrian pine, common hackberry.	Honey locust, northern red oak, silver maple, golden willow, green ash.	Eastern cottonwood.
Gb: Gibbon	Redosier dogwood, American plum.	Common chokecherry	Eastern redcedar	Green ash, honeylocust, silver maple, Scotch pine, golden willow, Russian mulberry, Austrian pine.	Eastern cottonwood.
Gr: Grigston	American plum	Autumn-olive, Peking cotoneaster, Amur honeysuckle.	Eastern redcedar, common hackberry, midwest Manchurian crabapple, bur oak.	Honeylocust, Scotch pine, green ash, Austrian pine.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Ha----------------- Hall	Amur honeysuckle, American plum.	Amur maple, lilac, Peking cotoneaster.	Eastern redcedar, bur oak.	Austrian pine, Scotch pine, green ash, common hackberry, honeylocust.	---
Hc, HcB, HcC, HcD, HdC2, HdD2-------- Hastings	Amur honeysuckle, Peking cotoneaster, lilac.	Skunkbush sumac---	Eastern redcedar, Austrian pine, Scotch pine, Russian mulberry, green ash, common hackberry, bur oak.	Honeylocust-------	---
Hg----------------- Hobbs	Peking cotoneaster	American plum-----	Eastern redcedar, Russian mulberry.	Ponderosa pine, Austrian pine, honeylocust, green ash, silver maple, golden willow, common hackberry.	Eastern cottonwood.
HhB. Hobbs					
HkB---------------- Holder	Amur honeysuckle, Peking cotoneaster, lilac, skunkbush sumac.	---	Eastern redcedar, Austrian pine, Scotch pine, Russian mulberry, green ash, common hackberry, bur oak.	Honeylocust-------	---
IvC---------------- Inavale	Skunkbush sumac---	Silver buffaloberry.	Eastern redcedar, Scotch pine, jack pine.	Austrian pine, ponderosa pine.	---
IwC*: Inavale----------	Skunkbush sumac---	Silver buffaloberry.	Eastern redcedar, Scotch pine, jack pine.	Austrian pine, ponderosa pine.	---
Boel-------------	Redosier dogwood, American plum.	Common chokecherry	Eastern redcedar	Austrian pine, Russian mulberry, green ash, honeylocust, golden willow, Scotch pine, silver maple.	Eastern cottonwood.
JuC---------------- Judson	Gray dogwood------	Tatarian honeysuckle, redosier dogwood, Siberian peashrub, American plum.	Amur maple, eastern redcedar.	Common hackberry, Norway spruce, honeylocust.	Eastern cottonwood, silver maple.
Kz----------------- Kezan	Redosier dogwood, American plum.	Common chokecherry	---	Golden willow, green ash.	Eastern cottonwood.
La----------------- Lamo	American plum, redosier dogwood.	Common chokecherry	Eastern redcedar	Austrian pine, Scotch pine, Russian mulberry, green ash, honeylocust, silver maple, golden willow.	Eastern cottonwood.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
LoC2, LoD2: Longford	Lilac, Peking cotoneaster, Amur honeysuckle, skunkbush sumac.	---	Eastern redcedar, bur oak, honeylocust, Scotch pine, green ash, Russian mulberry, Austrian pine, common hackberry.	---	---
MnC, MnD2, MnE: Monona	Redosier dogwood, gray dogwood.	Tatarian honeysuckle.	Amur maple, eastern redcedar.	Norway spruce, common hackberry, honey locust, green ash, ponderosa pine.	Eastern cottonwood, silver maple.
MnF. Monona					
Mu, MuB: Muir	American plum	Peking cotoneaster, Amur honeysuckle, autumn-olive.	Bur oak, eastern redcedar, common hackberry, midwest Manchurian crabapple.	Scotch pine, honeylocust, Austrian pine, green ash.	---
Ob*:					
Olbut	Siberian peashrub, silver buffaloberry, Tatarian honeysuckle.	Eastern redcedar, Russian-olive.	Austrian pine, honeylocust, green ash.	Siberian elm	---
Butler	American plum, redosier dogwood.	Common chokecherry	Eastern redcedar	Austrian pine, Scotch pine, Russian mulberry, green ash, honeylocust, silver maple, golden willow.	Eastern cottonwood.
OvB: Ovina	American plum, redosier dogwood.	Common chokecherry	Eastern redcedar	Austrian pine, Scotch pine, Russian mulberry, green ash, honeylocust, silver maple, golden willow.	Eastern cottonwood.
OxC*:					
Ovina	American plum, redosier dogwood.	Common chokecherry	Eastern redcedar	Austrian pine, Scotch pine, Russian mulberry, green ash, honeylocust, silver maple, golden willow.	Eastern cottonwood.
Thurman	Amur honeysuckle, American plum.	Skunkbush sumac, autumn-olive.	Eastern redcedar, Russian mulberry, common hackberry.	Austrian pine, Scotch pine, jack pine, green ash, honeylocust.	---
PaC2, PaD2: Pawnee	Amur honeysuckle, lilac, skunkbush sumac, Peking cotoneaster.	Russian-olive	Austrian pine, eastern redcedar, ponderosa pine, green ash, honeylocust.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Pg*. Pits					
PoC2, PoD2, PoE2-- Ponca	Lilac, Peking cotoneaster.	Amur honeysuckle, skunkbush sumac.	Eastern redcedar, green ash, common hackberry, bur oak, Russian mulberry.	Austrian pine, Scotch pine, honeylocust.	---
PsD2*, PsE2*, PsF2*:					
Ponca------------	Lilac, Peking cotoneaster.	Amur honeysuckle, skunkbush sumac.	Eastern redcedar, green ash, common hackberry, bur oak, Russian mulberry.	Austrian pine, Scotch pine, honeylocust.	---
Crofton---------	Skunkbush sumac, Peking cotoneaster, Tatarian honeysuckle.	Russian-olive-----	Eastern redcedar, Austrian pine, ponderosa pine, Scotch pine, honeylocust, bur oak, green ash, common hackberry.	---	---
Sa*:					
Saltine----------	Lilac-------------	Silver buffalo-berry, eastern redcedar, Rocky Mountain juniper, Siberian peashrub, Tatarian honey-suckle.	Siberian elm, Russian-olive, green ash.	---	---
Gibbon-----------	Redosier dogwood, American plum.	Common chokecherry	Eastern redcedar	Green ash, honeylocust, silver maple, Scotch pine, golden willow, Russian mulberry, Austrian pine.	Eastern cottonwood.
Sc. Scott					
Sh, ShC, ShC2, ShD, ShD2-------- Sharpsburg	Peking cotoneaster, lilac, skunkbush sumac.	Amur honeysuckle	Green ash, common hackberry, bur oak, eastern redcedar, Russian mulberry.	Austrian pine, Scotch pine, honeylocust.	---
Sk*--------------- Silver Creek	Siberian peashrub, silver buffaloberry.	Eastern redcedar, Russian-olive.	Austrian pine, honeylocust, green ash.	Siberian elm------	---
SmB. Simeon					
StD2-------------- Steinauer	Skunkbush sumac, Peking cotoneaster, Tatarian honeysuckle.	Russian-olive-----	Eastern redcedar, ponderosa pine, Austrian pine, bur oak, Scotch pine, honeylocust, common hackberry, green ash.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
StF, StG. Steinauer					
ThC Thurman	Amur honeysuckle, American plum.	Skunkbush sumac, autumn-olive.	Eastern redcedar, Russian mulberry, common hackberry.	Austrian pine, Scotch pine, jack pine, green ash, honeylocust.	---
TkD*: Thurman	Amur honeysuckle, American plum.	Skunkbush sumac, autumn-olive.	Eastern redcedar, Russian mulberry, common hackberry.	Austrian pine, Scotch pine, jack pine, green ash, honeylocust.	---
Monona	Redosier dogwood, gray dogwood.	Tatarian honeysuckle, Siberian dogwood.	Amur maple, eastern redcedar.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
UaF2 Uly	---	Siberian peashrub, American plum, Tatarian honey-suckle, lilac.	Common hackberry, blue spruce, Russian-olive, bur oak, eastern redcedar.	Honeylocust, green ash, ponderosa pine.	---
UbF*, UcF2*: Uly.					
Coly.					
UhF2*: Uly.					
Hobbs.					
UkC2 Uly Variant	Siberian peashrub, silver buffaloberry, Tatarian honeysuckle.	Eastern redcedar, Russian-olive.	Austrian pine, honeylocust, green ash.	Siberian elm	---
WoB Wood River	Amur honeysuckle, lilac, Peking cotoneaster, skunkbush sumac.	---	Eastern redcedar, Austrian pine, Scotch pine, Russian mulberry, green ash, common hackberry, bur oak.	Honeylocust	---
Zk, Zo Zook	Silky dogwood, lilac.	Amur honeysuckle	Eastern redcedar, Norway spruce, Amur maple, common hackberry.	Green ash, American sycamore, pin oak, honeylocust.	Silver maple, eastern cottonwood.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Af------------------- Alda	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight------------	Moderate: floods.
Ba------------------- Barney	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
Bd, BdC-------------- Blendon	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
Bf*:					
Blendon-------------	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
Muir----------------	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
Bh------------------- Boel	Severe: floods.	Moderate: floods, wetness.	Severe: floods.	Moderate: wetness, floods.	Moderate: wetness, droughty, floods.
Bn*:					
Boel----------------	Severe: floods.	Moderate: floods, wetness.	Severe: floods.	Moderate: wetness, floods.	Moderate: wetness, droughty, floods.
Alda----------------	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight------------	Moderate: floods.
Br------------------- Brocksburg	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
BsD, BsE------------- Burchard	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight------------	Moderate: slope.
BtE2*:					
Burchard------------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight------------	Moderate: slope.
Steinauer-----------	Moderate: percs slowly, slope.	Moderate: slope, percs slowly.	Severe: slope.	Slight------------	Moderate: slope.
Bu------------------- Butler	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
CfG------------------ Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
CoB------------------ Cozad	Severe: floods.	Slight----------	Moderate: slope.	Slight------------	Slight.
CrD2, CrE2----------- Crofton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
CrF2----------------- Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CrG------------------- Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Fm-------------------- Fillmore	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
Gb-------------------- Gibbon	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Moderate: wetness.	Moderate: wetness, floods.
Gr-------------------- Grigston	Severe: floods.	Slight----------	Slight----------	Slight------------	Slight.
Ha-------------------- Hall	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
Hc, HcB--------------- Hastings	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
HcC------------------- Hastings	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
HcD------------------- Hastings	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope.
HdC2------------------ Hastings	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
HdD2------------------ Hastings	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope.
Hg-------------------- Hobbs	Severe: floods.	Slight----------	Moderate: floods.	Slight------------	Moderate: floods.
HhB------------------- Hobbs	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
HkB------------------- Holder	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
IvC------------------- Inavale	Severe: floods.	Slight----------	Moderate: slope.	Slight------------	Moderate: droughty.
IwC*: Inavale---------------	Severe: floods.	Slight----------	Moderate: slope, floods.	Slight------------	Moderate: floods, droughty.
Boel------------------	Severe: floods.	Moderate: floods, wetness.	Severe: floods.	Moderate: wetness, floods.	Moderate: wetness, droughty, floods.
JuC------------------- Judson	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
Kz-------------------- Kezan	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: wetness, floods.	Severe: floods.
La-------------------- Lamo	Severe: floods.	Moderate: wetness, percs slowly.	Moderate: wetness, floods, percs slowly.	Slight------------	Moderate: floods.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LoC2 Longford	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
LoD2 Longford	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MnC Monona	Slight	Slight	Moderate: slope.	Slight	Slight.
MnD2, MnE Monona	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
MnF Monona	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Mu Muir	Severe: floods.	Slight	Slight	Slight	Slight.
MuB Muir	Severe: floods.	Slight	Moderate: slope.	Slight	Slight.
Ob*:					
Olbut	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, erodes easily.	Severe: ponding.
Butler	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
OvB Ovina	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
OxC*:					
Ovina	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Thurman	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
PaC2 Pawnee	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
PaD2 Pawnee	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Pg*. Pits					
PoC2 Ponca	Slight	Slight	Moderate: slope.	Slight	Slight.
PoD2, PoE2 Ponca	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
PsD2*, PsE2*:					
Ponca	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Crofton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
PsF2*:					
Ponca	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
PsF2*:					
Crofton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Sa*:					
Saltine	Severe: floods, excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Slight	Severe: excess salt, excess sodium.
Gibbon	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Moderate: wetness.	Moderate: wetness, floods.
Sc Scott	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, erodes easily.	Severe: ponding.
Sh Sharpsburg	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
ShC, ShC2 Sharpsburg	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
ShD, ShD2 Sharpsburg	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Sk* Silver Creek	Severe: floods, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
SmB Simeon	Slight	Slight	Slight	Slight	Moderate: droughty.
StD2 Steinauer	Moderate: percs slowly, slope.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
StF Steinauer	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
StG Steinauer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
ThC Thurman	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
TkD*:					
Thurman	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Monona	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
UaF2 Uly	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
UbF*, UcF2*:					
Uly	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
UhF2*:					
Uly	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Hobbs	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
UkC2 Uly Variant	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
WoB Wood River	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
Zk, Zo Zook	Severe: wetness, floods.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, floods.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Af: Alda	Fair	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair	Good.
Ba: Barney	Very poor.	Poor	Fair	Poor	Poor	Fair	Good	Good	Poor	Poor	Good	Fair.
Bd, BdC: Blendon	Fair	Fair	Good	Fair	Very poor.	---	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Good.
Bf*:												
Blendon	Fair	Fair	Good	Fair	Very poor.	---	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Good.
Muir	Good	Good	Good	Good	Fair	Good	Poor	Very poor.	Good	---	Very poor.	Good.
Bh: Boel	Fair	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Poor	Fair.
Bn*:												
Boel	Fair	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Poor	Fair.
Alda	Fair	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair	Good.
Br: Brocksburg	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Fair.
BsD, BsE: Burchard	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
BtE2*:												
Burchard	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Steinauer	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Bu: Butler	Good	Good	Good	---	Good	Good	Fair	Fair	Good	---	Fair	Good.
CfG: Coly	Very poor.	Very poor.	Poor	Poor	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
CoB: Cozad	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
CrD2, CrE2: Crofton	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
CrF2, CrG: Crofton	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Fm: Fillmore	Fair	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Good	Fair.
Gb: Gibbon	Good	Good	Good	Good	Fair	Good	Fair	Good	Good	Good	Fair	Good.
Gr: Grigston	Good	Good	Good	---	---	Fair	Poor	Fair	Good	---	Poor	Fair.
Ha: Hall	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Hc, HcB----------- Hastings	Good	Good	Good	Good	Good	Good	Very poor.	Poor	Good	Good	Very poor.	Good.
HcC, HcD, HdC2, HdD2----------- Hastings	Fair	Good	Good	Good	Fair	Good	Very poor.	Poor	Good	Good	Very poor.	Good.
Hg----------- Hobbs	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
HhB----------- Hobbs	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
HkB----------- Holder	Good	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Good.
IvC----------- Inavale	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
IwC*: Inavale-----------	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Boel-----------	Fair	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Poor	Fair.
JuC----------- Judson	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor	---
Kz----------- Kezan	Poor	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	Fair.
La----------- Lamo	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Fair	Fair	Good.
LoC2, LoD2----------- Longford	Fair	Good	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
MnC----------- Monona	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
MnD2----------- Monona	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
MnE----------- Monona	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
MnF----------- Monona	Poor	Fair	Good	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Mu, MuB----------- Muir	Good	Good	Good	Good	Fair	Good	Poor	Very poor.	Good	---	Very poor.	Good.
Ob*: Olbut-----------	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	---	Fair	Good.
Butler-----------	Good	Good	Good	---	Good	Good	Fair	Fair	Good	---	Fair	Good.
OvB----------- Ovina	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
OxC*: Ovina-----------	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Thurman-----------	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
PaC2, PaD2--------- Pawnee	Fair	Good	Good	---	Fair	Fair	Very poor.	Good	Good	---	Poor	Fair.
Pg*. Pits												
PoC2, PoD2, PoE2--- Ponca	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
PsD2*, PsE2*:												
Ponca-------------	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Crofton-----------	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
PsF2*:												
Ponca-------------	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Crofton-----------	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Sa*:												
Saltine-----------	Poor	Poor	Good	Poor	Poor	Poor	Fair	Good	Poor	Poor	Fair	Poor.
Gibbon------------	Good	Good	Good	Good	Fair	Good	Fair	Good	Good	Good	Fair	Good.
Sc----------------- Scott	Poor	Fair	Fair	---	Poor	Poor	Good	Good	Fair	---	Good	Fair.
Sh, ShC, ShC2------ Sharpsburg	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor	---
ShD, ShD2---------- Sharpsburg	Fair	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor	---
Sk*---------------- Silver Creek	Poor	Poor	Fair	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair.
SmB---------------- Simeon	Fair	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
StD2--------------- Steinauer	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
StF---------------- Steinauer	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
StG---------------- Steinauer	Very poor.	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
ThC---------------- Thurman	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
TkD*:												
Thurman-----------	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Monona------------	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
UaF2--------------- Uly	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
UbF*, UcF2*:												
Uly	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Coly	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
UhF2*:												
Uly	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Hobbs	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
UkC2 Uly Variant	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
WoB Wood River	Good	Good	Poor	Fair	Good	Poor	Very poor.	Very poor.	Fair	Good	Very poor.	Poor.
Zk, Zo Zook	Good	Fair	Good	Fair	Poor	---	Good	Good	Fair	Fair	Good	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Af----------------- Alda	Severe: wetness, cutbanks cave.	Severe: floods.	Severe: wetness, floods.	Severe: floods.	Severe: floods, frost action.	Moderate: floods.
Ba----------------- Barney	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.
Bd, BdC------------ Blendon	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Moderate: frost action.	Slight.
Bf*:						
Blendon-----------	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Moderate: frost action.	Slight.
Muir--------------	Slight----------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Slight.
Bh----------------- Boel	Severe: cutbanks cave, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.	Moderate: wetness, droughty, floods.
Bn*:						
Boel--------------	Severe: cutbanks cave, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.	Moderate: wetness, droughty, floods.
Alda--------------	Severe: wetness, cutbanks cave.	Severe: floods.	Severe: wetness, floods.	Severe: floods.	Severe: floods, frost action.	Moderate: floods.
Br----------------- Brocksburg	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight----------	Moderate: shrink-swell.	Severe: low strength.	Slight.
BsD, BsE----------- Burchard	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
BtE2*:						
Burchard----------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Steinauer---------	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Bu----------------- Butler	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, frost action.	Severe: wetness.
CfG---------------- Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
CoB---------------- Cozad	Slight----------	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, frost action.	Slight.
CrD2, CrE2--------- Crofton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CrF2, CrG: Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Fm: Fillmore	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, low strength, frost action.	Severe: ponding.
Gb: Gibbon	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods, frost action.	Moderate: wetness, floods.
Gr: Grigston	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Slight.
Ha: Hall	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Hc, HcB, HcC: Hastings	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
HcD: Hastings	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
HdC2: Hastings	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
HdD2: Hastings	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
Hg: Hobbs	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Moderate: floods.
HhB: Hobbs	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Severe: floods.
HkB: Holder	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
IvC: Inavale	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: droughty.
IwC*:						
Inavale	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, droughty.
Boel	Severe: cutbanks cave, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.	Moderate: wetness, droughty, floods.
JuC: Judson	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Kz: Kezan	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, floods, frost action.	Severe: floods.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
La----------------- Lamo	Severe: wetness.	Severe: floods, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, shrink-swell.	Severe: low strength, floods, frost action.	Moderate: floods.
LoC2--------------- Longford	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
LoD2--------------- Longford	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
MnC---------------- Monona	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength, frost action.	Slight.
MnD2, MnE---------- Monona	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
MnF---------------- Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Mu, MuB------------ Muir	Slight---------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Slight.
Ob*:						
Olbut--------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Butler-------------	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, frost action.	Severe: wetness.
OvB---------------- Ovina	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
OxC*:						
Ovina--------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Thurman------------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
PaC2--------------- Pawnee	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: droughty.
PaD2--------------- Pawnee	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, frost action, shrink-swell.	Moderate: slope, droughty.
Pg*. Pits						
PoC2--------------- Ponca	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
PoD2, PoE2--------- Ponca	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PsD2*, PsE2*:						
Ponca	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Crofton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
PsF2*:						
Ponca	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Crofton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Sa*:						
Saltine	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, floods, frost action.	Severe: excess salt, excess sodium.
Gibbon	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods, frost action.	Moderate: wetness, floods.
Sc Scott	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
Sh Sharpsburg	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, frost action, shrink-swell.	Slight.
ShC, ShC2 Sharpsburg	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, frost action, shrink-swell.	Slight.
ShD, ShD2 Sharpsburg	Moderate: too clayey, slope.	Severe: shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: slope.
Sk* Silver Creek	Severe: cutbanks cave, wetness.	Severe: floods, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, shrink-swell.	Severe: low strength, frost action.	Severe: excess sodium.
SmB Simeon	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
StD2 Steinauer	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
StF, StG Steinauer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
ThC Thurman	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
TkD*:						
Thurman-----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Monona------------	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
UaF2--------------- Uly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
UbF*, UcF2*:						
Uly---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Coly--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
UhF2*:						
Uly---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Hobbs-------------	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Moderate: floods.
UkC2--------------- Uly Variant	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: excess sodium.
WoB---------------- Wood River	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: excess sodium.
Zk, Zo------------- Zook	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, low strength, frost action.	Moderate: wetness, floods.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Af-------------------- Alda	Severe: floods, wetness, poor filter.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: too sandy, seepage.
Ba-------------------- Barney	Severe: floods, wetness, poor filter.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy, wetness.
Bd, BdC--------------- Blendon	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Bf*:					
Blendon---------------	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Muir------------------	Slight----------------	Moderate: seepage.	Moderate: too clayey.	Slight----------------	Fair: too clayey.
Bh-------------------- Boel	Severe: floods, wetness, poor filter.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy.
Bn*:					
Boel------------------	Severe: floods, wetness, poor filter.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy.
Alda------------------	Severe: floods, wetness, poor filter.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: too sandy, seepage.
Br-------------------- Brocksburg	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
BsD, BsE-------------- Burchard	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
BtE2*:					
Burchard--------------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Steinauer-------------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Bu-------------------- Butler	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
CfG------------------- Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CoB: Cozad	Moderate: floods, percs slowly.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
CrD2, CrE2: Crofton	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
CrF2, CrG: Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Fm: Fillmore	Severe: percs slowly, ponding.	Severe: ponding.	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Gb: Gibbon	Severe: floods, wetness.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Fair: wetness.
Gr: Grigston	Moderate: floods.	Moderate: seepage.	Moderate: floods, too clayey.	Moderate: floods.	Fair: too clayey.
Ha: Hall	Slight	Moderate: seepage.	Severe: seepage.	Slight	Fair: too clayey.
Hc, HcB: Hastings	Moderate: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
HcC: Hastings	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
HcD: Hastings	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
HdC2: Hastings	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
HdD2: Hastings	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Hg, HhB: Hobbs	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
HkB: Holder	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
IvC: Inavale	Severe: poor filter.	Severe: seepage, floods.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
IwC*:					
Inavale	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: seepage, too sandy, floods.	Severe: seepage, floods.	Poor: too sandy, seepage.
Boel	Severe: floods, wetness, poor filter.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
JuC Judson	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Kz Kezan	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
La Lamo	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: hard to pack.
LoC2 Longford	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
LoD2 Longford	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
MnC Monona	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
MnD2, MnE Monona	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
MnF Monona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Mu, MuB Muir	Moderate: floods.	Moderate: seepage.	Moderate: floods, too clayey.	Moderate: floods.	Fair: too clayey.
Ob*:					
Olbut	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: hard to pack, ponding.
Butler	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
OvB Ovina	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
OxC*:					
Ovina	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
Thurman	Severe: poor filter.	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
PaC2 Pawnee	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
PaD2 Pawnee	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Pg*. Pits					

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PoC2: Ponca	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
PoD2, PoE2: Ponca	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
PsD2*, PsE2*:					
Ponca	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Crofton	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
PsF2*:					
Ponca	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Crofton	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Sa*:					
Saltine	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, excess sodium.	Severe: floods, wetness.	Poor: excess salt, excess sodium.
Gibbon	Severe: floods, wetness.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Fair: wetness.
Sc: Scott	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Sh: Sharpsburg	Severe: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
ShC, ShC2: Sharpsburg	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
ShD, ShD2: Sharpsburg	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Sk*: Silver Creek	Severe: wetness, percs slowly.	Severe: seepage, floods, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, excess sodium.
SmB: Simeon	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
StD2: Steinauer	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
StF, StG: Steinauer	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ThC: Thurman	Severe: poor filter.	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
TkD*:					
Thurman	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
Monona	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
UaF2: Uly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
UbF*, UcF2*:					
Uly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
UhF2*:					
Uly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Hobbs	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
UkC2: Uly Variant	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Poor: excess salt.
WoB: Wood River	Severe: percs slowly.	Moderate: seepage, slope.	Severe: excess sodium.	Slight	Poor: hard to pack, excess sodium.
Zk, Zo: Zook	Severe: percs slowly, wetness, floods.	Severe: wetness, floods.	Severe: wetness, too clayey, floods.	Severe: wetness, floods.	Poor: too clayey, wetness, hard to pack.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Af: Alda	Fair: wetness.	Probable	Probable	Poor: area reclaim.
Ba: Barney	Poor: wetness.	Probable	Improbable: too sandy.	Poor: thin layer, wetness.
Bd, BdC: Blendon	Good	Probable	Improbable: too sandy.	Fair: thin layer.
Bf*:				
Blendon	Good	Probable	Improbable: too sandy.	Fair: thin layer.
Muir	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bh: Boel	Fair: wetness.	Probable	Improbable: too sandy.	Fair: thin layer.
Bn*:				
Boel	Fair: wetness.	Probable	Improbable: too sandy.	Fair: thin layer.
Alda	Fair: wetness.	Probable	Probable	Poor: area reclaim.
Br: Brocksburg	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
BsD, BsE: Burchard	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
BtE2*:				
Burchard	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Steinauer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
Bu: Butler	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
CfG: Coly	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CoB: Cozad	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
CrD2, CrE2: Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
CrF2: Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CrG: Crofton	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Fm: Fillmore	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, thin layer.
Gb: Gibbon	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Gr: Grigston	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ha: Hall	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hc, HcB, HcC, HcD, HdC2, HdD2: Hastings	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Hg, HhB: Hobbs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
HkB: Holder	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
IvC: Inavale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
IwC*:				
Inavale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Boel	Fair: wetness.	Probable	Improbable: too sandy.	Good.
JuC: Judson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Kz: Kezan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: wetness.
La: Lamo	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
LoC2, LoD2: Longford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MnC: Monona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
MnD2, MnE: Monona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
MnF: Monona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Mu, MuB: Muir	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ob*:				
Olbut	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Butler	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
OvB: Ovina	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
OxC*:				
Ovina	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Thurman	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
PaC2, PaD2: Pawnee	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Pg*. Pits				
PoC2: Ponca	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
PoD2, PoE2: Ponca	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
PsD2*, PsE2*:				
Ponca	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
PsF2*:				
Ponca	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Sa*:				
Saltine	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
Gibbon	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Sc: Scott	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Sh, ShC, ShC2, ShD, ShD2: Sharpsburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Sk*: Silver Creek	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
SmB: Simeon	Good	Probable	Improbable: too sandy.	Poor: area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
StD2: Steinauer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
StF: Steinauer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
StG: Steinauer	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
ThC: Thurman	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
TkD*:				
Thurman	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
Monona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
UaF2: Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
UbF*, UcF2*:				
Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Coly	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
UhF2*:				
Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hobbs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
UkC2: Uly Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
WoB: Wood River	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Zk: Zook	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Zo: Zook	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
Af----------------- Alda	Severe: seepage.	Severe: seepage, piping.	Floods, frost action, cutbanks cave.	Wetness, soil blowing, floods.	Wetness, too sandy, soil blowing.	Favorable.
Ba----------------- Barney	Severe: seepage.	Severe: seepage, piping, wetness.	Floods, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty, rooting depth.
Bd, BdC------------ Blendon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing---	Too sandy, soil blowing.	Favorable.
Bf*:						
Blendon-----------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing---	Too sandy, soil blowing.	Favorable.
Muir--------------	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable------	Favorable------	Favorable.
Bh----------------- Boel	Severe: seepage.	Severe: seepage, piping, wetness.	Floods, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Droughty, rooting depth.
Bn*:						
Boel--------------	Severe: seepage.	Severe: seepage, piping, wetness.	Floods, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Droughty, rooting depth.
Alda--------------	Severe: seepage.	Severe: seepage, piping.	Floods, frost action, cutbanks cave.	Wetness, soil blowing, floods.	Wetness, too sandy, soil blowing.	Favorable.
Br----------------- Brocksburg	Severe: seepage.	Severe: seepage.	Deep to water	Soil blowing---	Too sandy, soil blowing.	Favorable.
BsD, BsE----------- Burchard	Severe: slope.	Slight---------	Deep to water	Slope----------	Slope----------	Slope.
BtE2*:						
Burchard----------	Severe: slope.	Slight---------	Deep to water	Slope----------	Slope----------	Slope.
Steinauer---------	Severe: slope.	Moderate: piping.	Deep to water	Slope----------	Slope----------	Slope.
Bu----------------- Butler	Moderate: seepage.	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
CfG---------------- Coly	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
CoB---------------- Cozad	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
CrD2, CrE2, CrF2, CrG---------------- Crofton	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Fm----------------- Fillmore	Moderate: seepage.	Severe: hard to pack, ponding.	Percs slowly, frost action, ponding.	Percs slowly, ponding, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Gb: Gibbon	Severe: seepage.	Severe: piping, wetness.	Floods, frost action.	Wetness, floods.	Wetness	Favorable.
Gr: Grigston	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
Ha: Hall	Moderate: seepage.	Moderate: thin layer.	Deep to water	Favorable	Erodes easily	Erodes easily.
Hc, HcB: Hastings	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Favorable	Erodes easily	Erodes easily.
HcC: Hastings	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope	Erodes easily	Erodes easily.
HcD: Hastings	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
HdC2: Hastings	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope	Erodes easily	Erodes easily.
HdD2: Hastings	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Hg, HhB: Hobbs	Moderate: seepage.	Severe: piping.	Deep to water	Floods	Favorable	Favorable.
HkB: Holder	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
IvC: Inavale	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
IwC*:						
Inavale	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Boel	Severe: seepage.	Severe: seepage, piping, wetness.	Floods, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
JuC: Judson	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Kz: Kezan	Moderate: seepage.	Severe: piping, wetness.	Floods, frost action.	Wetness, floods.	Wetness	Wetness.
La: Lamo	Slight	Moderate: piping, hard to pack, wetness.	Floods, frost action.	Wetness, floods.	Wetness	Favorable.
LoC2: Longford	Moderate: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
LoD2: Longford	Severe: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
MnC: Monona	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
MnD2, MnE, MnF: Monona	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Mu, MuB: Muir	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
Ob*:						
Olbut	Moderate: seepage.	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.
Butler	Moderate: seepage.	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
OvB: Ovina	Severe: seepage.	Severe: piping, wetness.	Frost action	Wetness, fast intake.	Wetness, soil blowing.	Wetness.
OxC*:						
Ovina	Severe: seepage.	Severe: piping, wetness.	Frost action	Wetness, fast intake.	Wetness, soil blowing.	Wetness.
Thurman	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
PaC2: Pawnee	Moderate: slope.	Severe: hard to pack.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily.
PaD2: Pawnee	Severe: slope.	Severe: hard to pack.	Deep to water	Percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily.
Pg*. Pits						
PoC2: Ponca	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
PoD2, PoE2: Ponca	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
PsD2*, PsE2*, PsF2*:						
Ponca	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Crofton	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Sa*:						
Saltine	Moderate: seepage.	Severe: excess sodium, excess salt.	Percs slowly, floods, frost action.	Wetness, percs slowly, floods.	Wetness	Excess salt, excess sodium, percs slowly.
Gibbon	Severe: seepage.	Severe: piping, wetness.	Floods, frost action.	Wetness, floods.	Wetness	Favorable.
Sc: Scott	Moderate: seepage.	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Sh------ Sharpsburg	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Favorable	Erodes easily	Erodes easily.
ShC, ShC2------ Sharpsburg	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope	Erodes easily	Erodes easily.
ShD, ShD2------ Sharpsburg	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Sk*------ Silver Creek	Severe: seepage.	Severe: excess sodium.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Excess sodium, erodes easily, percs slowly.
SmB------ Simeon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
StD2, StF, StG------ Steinauer	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
ThC------ Thurman	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
TkD*:						
Thurman------	Severe: slope, seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Droughty, slope.
Monona------	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
UaF2------ Uly	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
UbF*, UcF2*:						
Uly------	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Coly------	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
UhF2*:						
Uly------	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Hobbs------	Moderate: seepage.	Severe: piping.	Deep to water	Floods	Favorable	Favorable.
UkC2------ Uly Variant	Moderate: seepage, slope.	Severe: piping, excess sodium.	Deep to water	Slope, erodes easily, excess salt.	Erodes easily	Erodes easily.
WoB------ Wood River	Moderate: seepage.	Severe: piping, excess sodium.	Deep to water	Percs slowly	Erodes easily	Excess sodium, erodes easily, percs slowly.
Zk, Zo------ Zook	Slight	Severe: hard to pack, wetness.	Floods, percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Af--------------- Alda	0-14	Fine sandy loam	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	30-50	<20	NP-5
	14-26	Fine sandy loam, sandy loam.	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	30-50	<20	NP-5
	26-60	Coarse sand, gravelly sand.	SP, SM, SP-SM	A-1, A-3, A-2	0	70-95	65-95	30-95	3-15	<20	NP
Ba--------------- Barney	0-7	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	90-100	90-100	85-95	60-95	20-35	3-15
	7-14	Stratified loam to fine sand.	SM, ML	A-2, A-4	0	90-100	90-100	55-80	20-60	---	NP
	14-60	Coarse sand, sand, fine sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	90-100	85-100	30-70	3-15	---	NP
Bd, BdC---------- Blendon	0-15	Fine sandy loam	SM	A-4	0	100	90-100	60-100	35-50	20-30	NP-5
	15-32	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	85-100	60-100	35-60	20-33	NP-10
	32-44	Fine sandy loam, sandy loam.	SM, SC	A-4, A-6	0	100	85-100	60-100	35-45	20-30	NP-12
	44-60	Fine sandy loam, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-4	0	85-100	65-100	50-100	10-45	<30	NP-5
Bf*:											
Blendon----------	0-15	Fine sandy loam	SM, ML	A-4	0	100	90-100	60-100	35-55	20-30	NP-5
	15-32	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	85-100	60-100	35-60	20-33	NP-10
	32-44	Fine sandy loam, sandy loam.	SM	A-4	0	100	85-100	60-100	35-45	20-30	NP-5
	44-60	Fine sandy loam, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-4	0	85-100	65-100	50-100	10-45	<30	NP-5
Muir-------------	0-14	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	85-100	25-40	8-20
	14-60	Silt loam, silty clay loam, loam.	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-40	4-20
Bh--------------- Boel	0-14	Loam-------------	ML	A-4	0	100	100	85-95	70-95	24-35	2-10
	14-60	Fine sand, loamy very fine sand, coarse sand.	SP, SM	A-2, A-3	0	100	100	85-95	0-25	---	NP
Bn*:											
Boel-------------	0-17	Loam-------------	ML	A-4	0	100	100	85-95	70-95	24-35	2-10
	17-60	Fine sand, sand, coarse sand.	SP, SM	A-2, A-3	0	100	100	85-95	0-25	---	NP
Alda-------------	0-14	Fine sandy loam	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	30-50	<20	NP-5
	14-26	Fine sandy loam, sandy loam.	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	30-50	<20	NP-5
	26-60	Coarse sand, gravelly sand.	SP, SM, SP-SM	A-1, A-3, A-2	0	70-95	65-95	30-95	3-15	<20	NP
Br--------------- Brocksburg	0-12	Sandy loam-------	SM	A-4	0	100	100	70-85	35-50	<20	NP
	12-40	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	100	100	90-100	70-95	35-45	11-20
	40-60	Sand and gravel	SP, SP-SM, SM	A-1, A-2, A-3	0	85-95	40-90	20-60	3-15	---	NP
BsD, BsE--------- Burchard	0-12	Loam-------------	CL	A-6	0-5	95-100	95-100	80-95	55-75	25-40	11-22
	12-32	Clay loam--------	CL	A-6, A-7	0-5	95-100	90-100	85-95	65-80	35-50	20-30
	32-60	Clay loam--------	CL	A-6, A-7	0-5	95-100	90-100	85-95	60-80	35-50	15-30

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BtE2*:											
Burchard	0-7	Clay loam	CL	A-6, A-7	0-5	95-100	95-100	85-95	60-80	35-50	14-24
	7-25	Clay loam	CL	A-6, A-7	0-5	95-100	90-100	85-95	65-80	35-50	20-30
	25-60	Clay loam	CL	A-6, A-7	0-5	95-100	90-100	85-95	60-80	35-50	15-30
Steinauer	0-9	Clay loam	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-90	30-50	15-25
	9-18	Clay loam	CL, CH	A-6, A-7	0-5	95-100	95-100	90-100	70-90	30-55	12-30
	18-60	Loam, clay loam	CL	A-6, A-7	0-5	95-100	95-100	90-100	60-75	20-45	10-26
Bu Butler	0-14	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	20-40	5-15
	14-35	Clay, silty clay	CH	A-7	0	100	100	100	95-100	50-70	25-45
	35-40	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	100	95-100	35-60	15-35
	40-60	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	100	95-100	30-60	10-35
CfG Coly	0-5	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	24-37	2-12
	5-60	Silt loam	ML, CL, CL-ML	A-4	0	100	100	85-100	85-100	22-32	2-10
CoB Cozad	0-12	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	100	75-100	20-35	2-12
	12-29	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-95	20-35	2-12
	29-60	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	80-100	50-95	20-35	2-12
CrD2, CrE2, CrF2, CrG Crofton	0-6	Silt loam	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-48	11-20
	6-60	Silt loam	CL	A-6	0	100	100	95-100	95-100	32-40	11-18
Fm Fillmore	0-12	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	100	95-100	20-40	2-20
	12-34	Silty clay, clay	CH, CL	A-7	0	100	100	100	95-100	40-75	20-45
	34-60	Silt loam, silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	100	95-100	25-75	10-45
Gb Gibbon	0-14	Silty clay loam	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	70-90	30-40	12-22
	14-36	Silt loam, clay loam.	CL	A-6	0	100	100	90-100	50-90	20-38	11-20
	36-48	Stratified fine sandy loam to silt loam.	SM, SC, CL, ML	A-4	0	100	100	70-95	35-90	<25	NP-8
	48-60	Loamy sand	SM-SC, SM, SP-SM	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
Gr Grigston	0-19	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	25-40	5-20
	19-36	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	36-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	85-100	70-100	25-40	5-20
Ha Hall	0-18	Silt loam	CL, CL-ML, ML	A-4, A-6	0	100	100	95-100	95-100	25-40	5-20
	18-39	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	15-30
	39-60	Silt loam, silty clay loam.	CL	A-6	0	100	100	95-100	90-100	25-40	10-20
Hc, HcB, HcC, HcD	0-10	Silt loam, silty clay loam.	CL	A-6, A-4	0	100	100	100	95-100	28-40	8-18
Hastings	10-40	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	42-60	22-40
	40-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	30-48	11-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
HdC2, HdD2--------	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	30-45	11-22
Hastings	6-27	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	42-60	22-40
	27-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	30-48	11-25
Hg, HhB----------	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
Hobbs	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	25-40	5-20
HkB-------------- Holder	0-13	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	98-100	90-100	20-40	2-16
	13-42	Silty clay loam	CL	A-6, A-7	0	100	100	98-100	95-100	35-50	20-35
	42-60	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
IvC-------------- Inavale	0-8	Loamy sand-------	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
	8-21	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	90-100	65-85	5-30	<25	NP-5
	21-60	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	100	70-90	5-30	<25	NP-5
IwC*:											
Inavale---------	0-8	Loamy sand-------	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
	8-21	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	90-100	65-85	5-30	<25	NP-5
	21-60	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	100	70-90	5-30	<25	NP-5
Boel------------	0-12	Fine sandy loam	SM	A-4, A-2	0	100	100	85-95	20-40	<20	NP
	12-60	Fine sand, loamy fine sand, coarse sand.	SP, SM	A-2, A-3	0	100	100	85-95	0-25	---	NP
JuC-------------- Judson	0-20	Silt loam--------	CL, CL-ML	A-6, A-7, A-4	0	100	100	100	95-100	25-50	5-25
	20-42	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	30-50	15-25
	42-60	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-7, A-4	0	100	100	100	95-100	25-50	5-25
Kz--------------- Kezan	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	70-90	20-35	2-12
	6-32	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	80-95	25-40	4-19
	32-60	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	100	100	95-100	80-95	20-35	2-12
La--------------- Lamo	0-12	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	85-95	40-65	14-35
	12-60	Silty clay loam	CL, CH	A-7, A-6	0	100	100	95-100	85-95	30-55	11-35
LoC2, LoD2-------	0-7	Silty clay loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-95	25-40	5-20
Longford	7-48	Silty clay loam, silty clay, clay loam.	CH, CL	A-7-6	0	100	100	95-100	85-100	40-60	20-35
	48-60	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	100	100	95-100	70-95	30-45	10-25
MnC, MnD2, MnE, MnF-------------	0-13	Silt loam--------	ML, CL, MH	A-6, A-7	0	100	100	95-100	95-100	35-54	10-28
Monona	13-42	Silt loam, silty clay loam.	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-50	10-25
	42-60	Silt loam--------	CL	A-6, A-7	0	100	100	90-100	90-100	30-42	10-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Mu, MuB---------- Muir	0-28	Silt loam--------	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-42	8-20
	28-60	Silt loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	20-42	4-20
Ob*: Olbut-----------	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	20-40	5-18
	6-20	Silty clay, clay	CH	A-7	0	100	100	100	95-100	50-65	30-45
	20-29	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	100	95-100	30-60	10-35
	29-60	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	100	95-100	30-60	10-35
Butler----------	0-14	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	20-40	5-15
	14-35	Clay, silty clay	CH	A-7	0	100	100	100	95-100	50-70	30-45
	35-40	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	100	95-100	35-60	15-35
	40-60	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	100	95-100	30-60	10-35
OvB-------------- Ovina	0-21	Loamy fine sand	SM	A-2	0	100	100	70-90	15-30	---	NP
	21-29	Fine sandy loam, loam.	SM, ML	A-4	0	100	100	70-85	40-60	---	NP
	29-60	Fine sandy loam, loam.	SM, ML	A-4	0	100	100	70-85	40-60	---	NP
OxC*: Ovina-----------	0-20	Loamy fine sand	SM	A-2	0	100	100	70-90	15-30	---	NP
	20-50	Fine sandy loam, loam.	SM, ML	A-4	0	100	100	70-85	40-60	---	NP
	50-60	Loamy fine sand	SM	A-2	0	100	100	70-90	15-30	---	NP
Thurman---------	0-16	Loamy fine sand	SM, SP-SM	A-2, A-3, A-4	0	100	100	90-100	5-40	---	NP
	16-60	Loamy fine sand, fine sand, very fine sand.	SM, SP-SM	A-2, A-3	0	100	100	85-100	5-25	---	NP
PaC2, PaD2------- Pawnee	0-9	Clay loam--------	CL	A-6	0	95-100	95-100	85-100	70-90	30-40	10-20
	9-38	Clay-------------	CH	A-7	0	95-100	95-100	85-100	70-85	50-70	25-45
	38-60	Clay loam--------	CL, CH	A-7, A-6	0	95-100	95-100	80-100	70-90	35-55	20-40
Pg* Pits											
PoC2, PoD2, PoE2- Ponca	0-7	Silty clay loam	CL	A-6	0	100	100	100	95-100	30-40	11-21
	7-22	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-50	20-30
	22-60	Silty clay loam, silt loam.	CL	A-6	0	100	100	100	95-100	30-40	11-21
PsD2*, PsE2*, PsF2*: Ponca----------	0-7	Silty clay loam	CL	A-6	0	100	100	100	95-100	30-40	11-21
	7-22	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-50	20-30
	22-60	Silty clay loam, silt loam.	CL	A-6	0	100	100	100	95-100	30-40	11-21
Crofton--------	0-6	Silt loam--------	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-48	11-20
	6-60	Silt loam--------	CL	A-6	0	100	100	95-100	95-100	32-40	11-18
Sa*: Saltine---------	0-9	Silt loam--------	ML	A-4	0	100	100	85-100	60-90	25-35	3-8
	9-25	Silt loam, silty clay loam, loam.	CL	A-4, A-6, A-7	0	100	100	85-100	60-95	25-50	7-25
	25-60	Silty clay loam, silt loam, sandy clay loam.	CL	A-4, A-6, A-7	0	100	100	95-100	70-95	25-50	7-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Sa*:											
Gibbon----------	0-14	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	85-100	70-90	20-30	2-10
	14-36	Silt loam, clay loam.	CL	A-6	0	100	100	90-100	55-90	25-38	12-20
	36-60	Stratified fine sandy loam to silt loam.	SM, SC, CL, ML	A-4	0	100	100	70-95	35-90	<25	NP-8
Sc--------------- Scott	0-10	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	2-20
	10-36	Silty clay, clay	CH, CL	A-7	0	100	100	100	95-100	41-75	20-45
	36-49	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-60	20-40
	49-60	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6, A-7	0	100	100	90-100	90-100	25-50	8-24
Sh, ShC, ShC2, ShD, ShD2------- Sharpsburg	0-12	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-55	18-32
	12-46	Silty clay loam, silty clay.	CH, CL	A-7, A-6	0	100	100	100	95-100	35-60	20-35
	46-60	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-50	20-30
Sk*-------------- Silver Creek	0-15	Silt loam, clay loam.	CL	A-4, A-6	0	100	100	95-100	95-100	25-40	7-15
	15-23	Silty clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	95-100	40-60	25-35
	23-50	Sandy clay loam	CL-ML, SM-SC, CL, SC	A-4, A-6	0	100	100	70-85	40-55	20-30	4-15
	50-60	Loamy fine sand	SM	A-2	0	100	100	55-80	20-35	---	NP
SmB-------------- Simeon	0-13	Loamy sand-------	SM, SP-SM	A-2, A-3	0	95-100	90-100	51-80	5-35	---	NP
	13-60	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	90-100	75-100	40-80	2-30	---	NP
StD2, StF, StG--- Steinauer	0-9	Clay loam--------	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-90	30-50	15-25
	9-18	Clay loam--------	CL, CH	A-6, A-7	0-5	95-100	95-100	90-100	70-90	30-55	12-30
	18-60	Loam, clay loam	CL	A-6, A-7	0-5	95-100	95-100	90-100	60-75	20-45	10-26
ThC-------------- Thurman	0-10	Loamy fine sand	SM, SP-SM	A-2, A-3, A-4	0	100	100	90-100	5-40	---	NP
	10-60	Loamy fine sand, fine sand, very fine sand.	SM, SP-SM	A-2, A-3	0	100	100	85-100	5-25	---	NP
TkD*:											
Thurman---------	0-10	Loamy fine sand	SM, SP-SM	A-2, A-3, A-4	0	100	100	90-100	5-40	---	NP
	10-60	Loamy fine sand, fine sand, very fine sand.	SM, SP-SM	A-2, A-3	0	100	100	85-100	5-25	---	NP
Monona----------	0-13	Fine sandy loam	SM	A-4	0	100	90-100	60-100	35-50	20-30	NP-5
	13-42	Silt loam, loam	ML, CL	A-6	0	100	100	95-100	95-100	35-40	10-20
	42-60	Silt loam--------	CL	A-6	0	100	100	95-100	95-100	30-40	10-20
UaF2------------- Uly	0-8	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	8-23	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	23-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	7-15

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
UbF*, UcF2*:											
Uly-------------	0-8	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	8-23	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	23-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	7-15
Coly------------	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	24-37	2-12
	5-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4	0	100	100	85-100	85-100	22-32	2-10
UhF2*:											
Uly-------------	0-8	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	8-23	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	23-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	7-15
Hobbs-----------	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	25-40	5-20
UkC2------------ Uly Variant	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	30-45	11-22
	6-15	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-50	14-28
	15-60	Silt loam--------	CL	A-6, A-4	0	100	100	100	95-100	28-40	8-18
WoB------------- Wood River	0-9	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	20-40	3-15
	9-33	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	95-100	45-65	30-40
	33-60	Silty clay loam, silt loam.	CL, CH, CL-ML	A-7, A-6, A-4	0	100	100	95-100	95-100	20-60	5-40
Zk-------------- Zook	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
	13-60	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
Zo-------------- Zook	0-6	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
	6-60	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Af------------- Alda	0-14	5-12	1.60-1.80	2.0-6.0	0.16-0.18	6.6-7.8	<2	Low--------	0.20	4	3	1-2
	14-26	3-10	1.70-1.90	2.0-6.0	0.15-0.17	7.4-8.4	<2	Low--------	0.20			
	26-60	0-2	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Ba------------- Barney	0-7	10-20	1.40-1.50	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	2	4L	2-4
	7-14	3-10	1.60-1.80	2.0-20	0.09-0.14	6.6-8.4	<2	Low--------	0.17			
	14-60	0-5	1.50-1.70	>20	0.02-0.04	6.6-7.8	<2	Low--------	0.10			
Bd, BdC---------- Blendon	0-15	10-18	1.25-1.35	2.0-6.0	0.11-0.17	6.1-7.3	<2	Low--------	0.20	5	3	2-3
	15-32	10-20	1.20-1.30	0.6-6.0	0.11-0.18	6.1-7.3	<2	Low--------	0.20			
	32-44	10-15	1.25-1.35	2.0-6.0	0.09-0.15	6.1-7.3	<2	Low--------	0.20			
	44-60	5-18	1.30-1.45	2.0-20	0.08-0.15	6.6-8.4	<2	Low--------	0.20			
Bf*:												
Blendon---------	0-15	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	<2	Low--------	0.20	5	3	2-3
	15-32	10-20	1.20-1.30	0.6-6.0	0.11-0.18	6.1-7.3	<2	Low--------	0.20			
	32-60	10-15	1.25-1.35	2.0-6.0	0.09-0.15	6.1-7.3	<2	Low--------	0.20			
	32-60	5-18	1.30-1.45	2.0-20	0.08-0.15	6.6-8.4	<2	Low--------	0.20			
Muir------------	0-14	22-35	1.30-1.45	0.6-2.0	0.20-0.23	5.6-7.8	<2	Low--------	0.32	5	6	2-4
	14-60	18-35	1.35-1.55	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.32			
Bh------------- Boel	0-14	15-25	1.30-1.40	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	5	4L	1-2
	14-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.20			
Bn*:												
Boel------------	0-17	15-25	1.30-1.40	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	5	4L	1-2
	17-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.20			
Alda------------	0-14	5-12	1.60-1.80	2.0-6.0	0.16-0.18	6.6-7.8	<2	Low--------	0.20	4	3	1-2
	14-26	3-10	1.70-1.90	2.0-6.0	0.15-0.17	7.4-8.4	<2	Low--------	0.20			
	26-60	0-2	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Br------------- Brocksburg	0-12	5-15	1.40-1.60	2.0-6.0	0.16-0.18	5.6-7.3	<2	Low--------	0.28	4	3	1-2
	12-28	20-30	1.30-1.50	0.6-2.0	0.15-0.19	6.6-7.8	<2	Moderate	0.28			
	28-60	0-5	1.50-1.70	>20	0.02-0.04	6.6-7.8	<2	Low--------	0.10			
BsD, BsE--------- Burchard	0-12	18-27	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	<2	Moderate	0.28	5	5	2-4
	12-32	27-35	1.40-1.60	0.2-0.6	0.15-0.17	6.6-8.4	<2	Moderate	0.28			
	32-60	27-35	1.40-1.60	0.2-0.6	0.14-0.16	7.4-8.4	<2	Moderate	0.28			
BtE2*:												
Burchard--------	0-7	27-35	1.40-1.60	0.2-0.6	0.17-0.19	5.6-7.3	<2	Moderate	0.28	5	6	2-4
	7-25	27-35	1.40-1.60	0.2-0.6	0.15-0.17	6.6-8.4	<2	Moderate	0.28			
	25-60	27-35	1.40-1.60	0.2-0.6	0.14-0.16	7.4-8.4	<2	Moderate	0.28			
Steinauer-------	0-9	27-32	1.30-1.60	0.2-0.6	0.17-0.19	7.4-8.4	<2	Moderate	0.32	5	4L	.5-1
	9-18	27-32	1.30-1.60	0.2-0.6	0.15-0.17	7.9-8.4	<2	Moderate	0.32			
	18-60	16-30	1.30-1.60	0.2-2.0	0.14-0.19	7.9-8.4	<2	Moderate	0.32			
Bu------------- Butler	0-14	18-35	1.20-1.40	0.6-2.0	0.20-0.22	5.1-7.3	<2	Moderate	0.37	4	6	2-4
	14-35	45-55	1.10-1.20	0.06-0.2	0.11-0.13	6.1-7.8	<2	High-------	0.37			
	35-40	32-45	1.10-1.30	0.2-0.6	0.14-0.20	6.6-8.4	<2	High-------	0.37			
	40-60	20-35	1.20-1.40	0.6-2.0	0.18-0.22	6.6-8.4	<2	Moderate	0.37			
CfG------------ Coly	0-5	18-24	1.20-1.30	0.6-2.0	0.20-0.22	7.4-8.4	<2	Low--------	0.43	5	4L	.5-1
	5-60	18-24	1.10-1.20	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
CoB------------ Cozad	0-12	11-25	1.30-1.50	0.6-2.0	0.20-0.22	6.1-7.3	<2	Low--------	0.32	5	6	2-3
	12-29	10-18	1.30-1.50	0.6-2.0	0.17-0.19	6.1-8.4	<2	Low--------	0.43			
	29-60	8-18	1.20-1.40	0.6-2.0	0.15-0.19	6.6-8.4	<2	Low--------	0.24			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
CrD2, CrE2, CrF2, CrG---------- Crofton	0-6	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	<2	Low-------	0.43	5	4L	.5-1
	6-60	15-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low-------	0.43			
Fm-------------- Fillmore	0-12	18-27	1.30-1.40	0.6-2.0	0.21-0.24	5.6-6.5	<2	Moderate	0.37	4	6	2-4
	12-34	40-55	1.30-1.50	<0.06	0.11-0.14	5.6-7.8	<2	High------	0.37			
	34-60	18-45	1.30-1.50	0.06-2.0	0.14-0.22	6.6-8.4	<2	Moderate	0.37			
Gb-------------- Gibbon	0-14	20-25	1.40-1.60	0.6-2.0	0.21-0.23	7.4-8.4	<2	Moderate	0.32	5	4L	2-4
	14-36	20-27	1.30-1.50	0.6-2.0	0.18-0.22	7.9-8.4	<2	Moderate	0.32			
	36-48	15-25	1.50-1.70	0.6-6.0	0.16-0.20	7.9-9.0	<2	Low-------	0.32			
	48-60	7-15	1.50-1.60	6.0-20	0.05-0.10	8.5-9.0	<2	Low-------	0.17			
Gr-------------- Grigston	0-19	21-26	1.30-1.40	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low-------	0.32	5	6	2-4
	19-36	21-30	1.35-1.45	0.6-2.0	0.18-0.22	6.6-8.4	<2	Low-------	0.32			
	36-60	21-30	1.30-1.45	0.6-2.0	0.16-0.22	6.6-8.4	<2	Low-------	0.32			
Ha-------------- Hall	0-18	20-27	1.30-1.40	0.6-2.0	0.20-0.24	6.1-7.3	<2	Moderate	0.32	5	6	2-4
	18-39	28-35	1.30-1.50	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.43			
	39-60	15-30	1.30-1.40	0.6-2.0	0.18-0.22	6.6-7.8	<2	Moderate	0.43			
Hc, HcB, HcC, HcD------------ Hastings	0-10	18-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-6.8	<2	Moderate	0.32	5	6	2-3
	10-40	35-42	1.30-1.40	0.2-0.6	0.14-0.20	5.6-7.8	<2	High------	0.43			
	40-60	25-38	1.20-1.40	0.6-2.0	0.18-0.22	6.1-8.4	<2	Moderate	0.43			
HdC2, HdD2------- Hastings	0-6	28-35	1.20-1.40	0.6-2.0	0.21-0.23	5.6-6.5	<2	Moderate	0.32	5	7	1-2
	6-27	35-42	1.30-1.40	0.2-0.6	0.14-0.20	6.1-7.3	<2	High------	0.43			
	27-60	25-38	1.20-1.40	0.6-2.0	0.18-0.22	6.6-8.4	<2	Moderate	0.43			
Hg, HhB---------- Hobbs	0-7	15-30	1.10-1.30	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low-------	0.32	5	6	2-4
	7-60	15-30	1.20-1.40	0.6-2.0	0.18-0.22	6.6-8.4	<2	Low-------	0.32			
HkB-------------- Holder	0-13	15-25	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low-------	0.32	5	6	2-4
	13-42	28-35	1.20-1.40	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.43			
	42-60	15-30	1.40-1.60	0.6-2.0	0.20-0.22	6.6-8.4	<2	Moderate	0.43			
IvC-------------- Inavale	0-8	7-15	1.50-1.60	6.0-20	0.10-0.12	6.6-7.8	<2	Low-------	0.17	5	2	.5-1
	8-21	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low-------	0.17			
	21-60	3-10	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low-------	0.17			
IwC*:												
Inavale---------	0-8	7-15	1.50-1.60	6.0-20	0.10-0.12	6.6-7.8	<2	Low-------	0.17	5	2	.5-1
	8-21	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low-------	0.17			
	21-60	3-10	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low-------	0.17			
Boel------------	0-12	8-18	1.50-1.70	2.0-6.0	0.16-0.18	6.6-8.4	<2	Low-------	0.28	5	4L	1-2
	12-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low-------	0.20			
JuC-------------- Judson	0-20	20-27	1.30-1.35	0.6-2.0	0.21-0.23	6.1-7.3	<2	Moderate	0.28	5	6	2-4
	20-42	30-35	1.35-1.45	0.6-2.0	0.21-0.23	6.1-7.3	<2	Moderate	0.28			
	42-60	25-32	1.35-1.45	0.6-2.0	0.21-0.23	6.1-7.8	<2	Moderate	0.43			
Kz--------------- Kezan	0-6	24-27	1.20-1.40	0.6-2.0	0.22-0.24	6.6-7.8	<2	Low-------	0.32	5	6	2-4
	6-32	24-35	1.20-1.40	0.6-2.0	0.18-0.22	6.6-7.8	<2	Low-------	0.32			
	32-60	24-27	1.20-1.40	0.6-2.0	0.20-0.22	6.6-7.8	<2	Low-------	0.32			
La--------------- Lamo	0-12	27-35	1.40-1.60	0.2-0.6	0.21-0.23	7.4-8.4	<2	High------	0.28	5	7	2-4
	12-60	27-35	1.30-1.50	0.2-0.6	0.18-0.22	7.4-8.4	<2	High------	0.28			
LoC2, LoD2------- Longford	0-7	27-32	1.30-1.40	0.6-2.0	0.20-0.24	5.6-6.5	<2	Low-------	0.37	5	6	.5-1
	7-48	35-45	1.35-1.50	0.06-0.6	0.14-0.20	5.6-6.5	<2	High------	0.37			
	48-60	20-35	1.30-1.40	0.2-0.6	0.15-0.20	6.6-7.8	<2	Moderate	0.37			
MnC, MnD2, MnE, MnF------------ Monona	0-13	20-27	1.25-1.30	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	1-4
	13-42	24-30	1.30-1.35	0.6-2.0	0.20-0.22	6.1-7.3	<2	Moderate	0.43			
	42-60	18-24	1.35-1.40	0.6-2.0	0.20-0.22	6.6-8.4	<2	Moderate	0.43			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Mu, MuB---------- Muir	0-28	22-27	1.30-1.45	0.6-2.0	0.20-0.23	5.6-7.8	<2	Low--------	0.32	5	6	2-4
	28-60	18-35	1.35-1.55	0.6-2.0	0.18-0.22	6.1-7.8	<2	Low--------	0.32			
Ob*: Olbut-----------	0-6	20-32	1.20-1.30	0.6-2.0	0.20-0.22	6.1-7.8	2-4	Moderate	0.37	5	6	1-2
	6-20	40-55	1.30-1.40	0.06-0.2	0.10-0.13	6.1-8.4	4-8	High-------	0.37			
	20-29	20-40	1.30-1.40	0.2-0.6	0.16-0.20	7.4-8.4	4-8	High-------	0.37			
	29-60	20-35	1.20-1.40	0.6-2.0	0.18-0.20	7.9-9.0	2-4	Moderate	0.37			
Butler----------	0-14	18-35	1.20-1.40	0.6-2.0	0.20-0.22	5.1-7.3	<2	Moderate	0.37	4	6	2-4
	14-35	45-55	1.10-1.20	0.06-0.2	0.11-0.13	6.1-7.8	<2	High-------	0.37			
	35-40	32-45	1.10-1.30	0.2-0.6	0.14-0.20	6.6-8.4	<2	High-------	0.37			
	40-60	20-35	1.20-1.40	0.6-2.0	0.18-0.22	6.6-8.4	<2	Moderate	0.37			
OvB-------------- Ovina	0-21	3-10	1.30-1.50	6.0-20	0.10-0.12	6.6-8.4	<2	Low--------	0.17	5	2	1-2
	21-29	8-18	1.30-1.50	2.0-6.0	0.15-0.17	6.6-8.4	<2	Low--------	0.17			
	29-60	5-15	1.40-1.60	2.0-6.0	0.14-0.16	7.4-8.4	<2	Low--------	0.20			
OxC*: Ovina-----------	0-20	3-10	1.30-1.50	6.0-20	0.10-0.12	6.6-8.4	<2	Low--------	0.17	5	2	1-2
	20-50	8-18	1.30-1.50	2.0-6.0	0.15-0.17	6.6-8.4	<2	Low--------	0.17			
	50-60	3-10	1.60-1.80	6.0-20	0.10-0.12	7.4-8.4	<2	Low--------	0.17			
Thurman---------	0-16	5-12	1.60-1.80	6.0-20	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	2	1-2
	16-60	2-10	1.60-1.80	6.0-20	0.06-0.10	6.1-7.3	<2	Low--------	0.17			
PaC2, PaD2------- Pawnee	0-9	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.6-7.3	<2	Moderate	0.37	4	6	1-2
	9-38	40-50	1.50-1.70	0.06-0.2	0.09-0.11	6.1-8.4	<2	High-------	0.37			
	38-60	27-35	1.40-1.50	0.06-0.2	0.14-0.16	7.4-8.4	<2	High-------	0.37			
Pg*. Pits												
PoC2, PoD2, PoE2- Ponca	0-7	16-32	1.10-1.30	0.6-2.0	0.21-0.23	6.1-7.3	<2	Moderate	0.32	5	6	1-2
	7-27	22-32	1.20-1.40	0.6-2.0	0.18-0.20	6.6-8.4	<2	Moderate	0.43			
	27-60	16-30	1.20-1.40	0.6-2.0	0.18-0.20	7.4-8.4	<2	Moderate	0.43			
PsD2*, PsE2*, PsF2*: Ponca----------	0-7	16-32	1.10-1.30	0.6-2.0	0.21-0.23	6.1-7.3	<2	Moderate	0.32	5	6	1-2
	7-22	22-32	1.20-1.40	0.6-2.0	0.18-0.20	6.6-7.8	<2	Moderate	0.43			
	22-60	16-30	1.20-1.40	0.6-2.0	0.18-0.20	7.4-8.4	<2	Moderate	0.43			
Crofton--------	0-6	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	.5-1
	6-60	15-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
Sa*: Saltine---------	0-9	15-27	1.30-1.40	0.6-2.0	0.20-0.24	7.4-9.0	>4	Low--------	0.32	5	5	.5-2
	9-25	27-40	1.20-1.30	0.2-0.6	0.17-0.22	>8.4	>4	Moderate	0.32			
	25-60	20-40	1.40-1.50	0.2-2.0	0.18-0.22	7.9-9.0	<2	Moderate	0.32			
Gibbon----------	0-14	20-25	1.40-1.60	0.6-2.0	0.21-0.23	7.4-8.4	<2	Low--------	0.32	5	4L	2-4
	14-36	20-27	1.30-1.50	0.6-2.0	0.18-0.22	7.9-8.4	<2	Moderate	0.32			
	36-60	15-30	1.50-1.70	0.6-6.0	0.16-0.20	7.9-9.0	<2	Low--------	0.32			
Sc--------------- Scott	0-10	15-27	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low--------	0.37	4	6	2-4
	10-36	40-55	1.30-1.50	<0.06	0.10-0.14	5.6-7.8	<2	High-------	0.37			
	36-49	32-40	1.10-1.40	0.2-0.6	0.18-0.20	6.6-7.8	<2	High-------	0.37			
	49-60	18-40	1.30-1.50	0.6-2.0	0.14-0.22	6.6-7.8	<2	Moderate	0.37			
Sh, ShC, ShC2, ShD, ShD2------- Sharpsburg	0-12	27-34	1.30-1.35	0.6-2.0	0.21-0.23	5.1-6.5	<2	Moderate	0.32	5	7	1-4
	12-46	36-42	1.35-1.40	0.2-0.6	0.18-0.20	6.1-7.3	<2	High-------	0.43			
	46-60	28-32	1.40-1.45	0.6-2.0	0.18-0.20	6.1-7.3	<2	Moderate	0.43			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH	Mmhos/cm					Pct
Sk*: Silver Creek	0-15	20-35	1.20-1.30	0.6-2.0	0.22-0.24	6.6-7.8	2-4	Moderate	0.32	4	6	1-2
	15-23	35-48	1.10-1.20	0.06-0.2	0.11-0.20	7.4-8.4	2-8	High	0.32			
	23-50	20-35	1.30-1.50	0.6-2.0	0.15-0.17	7.9-9.0	2-4	Moderate	0.24			
	50-60	2-15	1.40-1.60	6.0-20	0.08-0.10	7.9-8.4	<2	Low	0.17			
SmB: Simeon	0-13	3-10	1.30-1.50	6.0-20	0.06-0.12	5.6-7.3	<2	Low	0.15	5	2	.5-1
	13-60	2-10	1.50-1.70	6.0-20	0.05-0.10	6.1-7.3	<2	Low	0.15			
StD2, StF, StG: Steinauer	0-9	27-32	1.30-1.60	0.2-0.6	0.17-0.19	7.4-8.4	<2	Moderate	0.32	5	4L	.5-2
	9-18	27-32	1.30-1.60	0.2-0.6	0.15-0.17	7.9-8.4	<2	Moderate	0.32			
	18-60	16-30	1.30-1.60	0.2-2.0	0.14-0.19	7.9-8.4	<2	Moderate	0.32			
ThC: Thurman	0-10	5-12	1.60-1.80	6.0-20	0.10-0.12	6.1-7.3	<2	Low	0.17	5	2	1-2
	10-60	2-10	1.60-1.80	6.0-20	0.06-0.10	6.1-7.3	<2	Low	0.17			
TkD*:												
Thurman	0-7	5-12	1.60-1.80	6.0-20	0.10-0.12	6.1-7.3	<2	Low	0.17	5	2	1-2
	7-60	2-10	1.60-1.80	6.0-20	0.06-0.10	6.1-7.3	<2	Low	0.17			
Monona	0-13	10-20	1.25-1.30	2.0-6.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	2-4
	13-42	24-27	1.30-1.35	0.6-2.0	0.20-0.22	6.1-7.3	<2	Moderate	0.43			
	42-60	18-24	1.35-1.40	0.6-2.0	0.20-0.22	6.6-8.4	<2	Moderate	0.43			
UaF2: Uly	0-8	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low	0.32	5	6	.5-1
	8-23	20-32	1.20-1.30	0.6-2.0	0.18-0.22	6.6-8.4	<2	Low	0.43			
	23-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low	0.43			
UbF*, UcF2*:												
Uly	0-8	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low	0.32	5	6	.5-2
	8-23	20-32	1.20-1.30	0.6-2.0	0.18-0.22	6.6-8.4	<2	Low	0.43			
	23-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low	0.43			
Coly	0-5	18-24	1.30-1.50	0.6-2.0	0.20-0.22	7.4-8.4	<2	Low	0.43	5	4L	.5-2
	5-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low	0.43			
UhF2*:												
Uly	0-8	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low	0.32	5	6	.5-1
	8-23	20-32	1.20-1.30	0.6-2.0	0.18-0.22	6.6-8.4	<2	Low	0.43			
	23-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low	0.43			
Hobbs	0-7	15-30	1.10-1.30	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low	0.32	5	6	2-4
	7-60	15-30	1.20-1.40	0.6-2.0	0.18-0.22	6.6-8.4	<2	Low	0.32			
UkC2: Uly Variant	0-6	28-35	1.20-1.40	0.2-0.6	0.21-0.23	7.4-7.8	2-4	Moderate	0.37	5	7	1-2
	6-15	27-35	1.30-1.40	0.2-0.6	0.18-0.20	7.4-8.4	4-8	Moderate	0.37			
	15-60	18-25	1.20-1.40	0.6-2.0	0.20-0.22	7.4-8.4	2-4	Moderate	0.37			
WoB: Wood River	0-9	14-24	1.10-1.30	0.6-2.0	0.22-0.24	5.6-7.3	<4	Low	0.37	3	6	2-4
	9-33	35-45	1.30-1.40	0.06-0.2	0.11-0.20	7.4-9.0	4-8	High	0.37			
	33-60	19-35	1.10-1.30	0.6-2.0	0.18-0.22	7.4-9.0	2-4	Moderate	0.37			
Zk: Zook	0-13	20-26	1.30-1.35	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.28	5	6	2-4
	13-60	36-45	1.30-1.45	0.06-0.2	0.15-0.17	5.6-7.8	<2	High	0.28			
Zo: Zook	0-6	32-38	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	<2	High	0.28	5	7	2-4
	6-60	36-45	1.30-1.45	0.06-0.2	0.15-0.17	5.6-7.8	<2	High	0.28			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Af----------------- Alda	C	Occasional	Brief-----	Apr-Jul	2.0-3.0	Apparent	Nov-May	>60	---	High-----	Moderate	Low.
Ba----------------- Barney	D	Frequent----	Long------	Mar-Jun	0-2.0	Apparent	Nov-Jun	>60	---	Moderate	High-----	Low.
Bd, BdC------------ Blendon	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Bf*:												
Blendon-----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Muir--------------	B	Rare--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Bh----------------- Boel	A	Occasional	Brief-----	Mar-Jun	1.5-3.5	Apparent	Nov-May	>60	---	Moderate	High-----	Low.
Bn*:												
Boel--------------	A	Occasional	Brief-----	Mar-Jun	1.5-3.5	Apparent	Nov-May	>60	---	Moderate	High-----	Low.
Alda--------------	C	Occasional	Brief-----	Apr-Jul	2.0-3.0	Apparent	Nov-May	>60	---	High-----	Moderate	Low.
Br----------------- Brocksburg	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
BsD, BsE----------- Burchard	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
BtE2*:												
Burchard----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Steinauer---------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Bu----------------- Butler	D	None--------	---	---	0.5-3.0	Perched	Mar-Jul	>60	---	High-----	High-----	Low.
CfG---------------- Coly	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
CoB---------------- Cozad	B	Rare--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
CrD2, CrE2, CrF2, CrG---------------- Crofton	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Fm**--------------- Fillmore	D	None--------	---	---	+.5-1.0	Perched	Mar-Jul	>60	---	High-----	High-----	Low.

See footnotes at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
Gb----------------- Gibbon	B	Occasional	Very brief	Mar-Jul	1.5-3.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
Gr----------------- Grigston	B	Rare--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Ha----------------- Hall	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Hc, HcB, HcC, HcD, HdC2, HdD2------- Hastings	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Hg----------------- Hobbs	B	Occasional	Brief-----	Apr-Sep	>6.0	---	---	>60	---	Moderate	Low------	Low.
HhB---------------- Hobbs	B	Frequent----	Brief-----	Apr-Sep	>6.0	---	---	>60	---	Moderate	Low------	Low.
HkB---------------- Holder	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Low.
IvC---------------- Inavale	A	Rare--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
IwC*:												
Inavale-----------	A	Occasional	Very brief	Jan-Jul	>6.0	---	---	>60	---	Low------	Moderate	Low.
Boel--------------	A	Occasional	Brief-----	Mar-Jun	1.5-3.5	Apparent	Nov-May	>60	---	Moderate	High-----	Low.
JuC---------------- Judson	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Low.
Kz----------------- Kezan	C	Frequent----	Brief-----	Mar-Jul	1.0-2.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
La----------------- Lamo	C	Occasional	Brief-----	Mar-Aug	2.0-3.0	Apparent	Nov-May	>60	---	High-----	High-----	Low.
LoC2, LoD2--------- Longford	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
MnC, MnD2, MnE, MnF---------------- Monona	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Low.
Mu, MuB------------ Muir	B	Rare--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Ob*:												
Olbut**-----------	D	None--------	---	---	+.5-3.0	Perched	Mar-Jul	>60	---	High-----	High-----	High.
Butler------------	D	None--------	---	---	0.5-3.0	Perched	Mar-Jul	>60	---	High-----	High-----	Low.

See footnotes at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
OvB---------------- Ovina	B	None--------	---	---	1.0-3.0	Apparent	May-Nov	>60	---	High-----	Moderate	Low.
OxC*:												
Ovina------------	B	None--------	---	---	1.0-3.0	Apparent	May-Nov	>60	---	High-----	Moderate	Low.
Thurman----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
PaC2, PaD2-------- Pawnee	D	None--------	---	---	1.0-3.0	Perched	Mar-May	>60	---	High-----	High-----	Low.
Pg*. Pits												
PoC2, PoD2, PoE2-- Ponca	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Low.
PsD2*, PsE2*, PsF2*:												
Ponca-----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Low.
Crofton---------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Sa*:												
Saltine----------	C	Occasional	Brief-----	Apr-Jul	2.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	High.
Gibbon-----------	B	Occasional	Very brief	Mar-Jul	2.0-3.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
Sc**-------------- Scott	D	None--------	---	---	+.5-1.0	Perched	Mar-Aug	>60	---	High-----	High-----	Low.
Sh, ShC, ShC2, ShD, ShD2-------- Sharpsburg	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
Sk*--------------- Silver Creek	D	Rare--------	---	---	2.0-4.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
SmB--------------- Simeon	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
StD2, StF, StG---- Steinauer	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
ThC--------------- Thurman	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
TkD*:												
Thurman----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
Monona-----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Low.
UaF2-------------- Uly	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.

See footnotes at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
UbF*, UcF2*:												
Uly	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Coly	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
UhF2*:												
Uly	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Hobbs	B	Occasional	Brief	Apr-Sep	>6.0	---	---	>60	---	Moderate	Low	Low.
UkC2 Uly Variant	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	High.
WoB Wood River	D	None	---	---	>6.0	---	---	>60	---	Low	High	High.
Zk, Zo Zook	C/D	Occasional	Brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-May	>60	---	High	High	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

** In the "High water table--Depth" column, a plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

TABLE 18.--ENGINEERING TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution									Liquid limit	Plasticity index	Specific gravity
			Percentage passing sieve--						Percentage smaller than--					
	AASHTO	Unified	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm			
												Pct		G/cc
Alda fine sandy loam: (S76NE-023-027)														
A11------ 0 to 10	A-2-4(00)	SM	100	100	100	100	97	32	25	7	5	20	NP	2.61
C1-------14 to 19	A-2-4(00)	SM	100	100	100	100	99	32	16	3	3	--	NP	2.63
IIC------26 to 60	A-3 (02)	SP-SM	100	100	100	100	95	6	3	1	1	--	NP	2.63
Blendon fine sandy loam: (S78NE-023-013)														
Ap------- 0 to 7	A-4 (07)	ML	100	100	100	100	96	71	60	15	12	22	1	2.61
B21------15 to 21	A-4 (06)	CL	100	100	100	100	92	64	57	17	14	28	9	2.60
C1-------32 to 44	A-6 (01)	SC	100	100	100	100	87	37	32	12	9	28	12	2.63
Butler silt loam: (S75NE-023-018)														
A12------ 7 to 14	A-6 (10)	CL	100	100	100	100	100	99	93	35	28	39	14	2.61
B22t-----24 to 35	A-7-6(19)	CH	100	98	98	98	98	97	94	49	43	55	29	2.68
C1-------40 to 56	A-7-6(14)	CL	100	100	100	100	100	99	93	39	32	46	22	2.69
Gibbon silty clay loam: (S76NE-023-050)														
Ap------- 0 to 7	A-6 (13)	CL	100	100	100	100	98	81	71	24	19	37	22	2.62
C1-------19 to 26	A-6 (23)	CL	100	100	100	100	93	58	52	30	27	33	17	2.67
C2-------26 to 36	A-6 (33)	SC	100	100	100	100	93	50	47	28	24	24	11	2.68
Hastings silt loam: (S75NE-023-008)														
A12------ 6 to 11	A-6 (08)	CL	100	100	100	100	100	99	93	32	25	34	11	2.61
B21t-----16 to 34	A-7-6(16)	CL-CH	100	100	100	100	100	99	94	40	34	50	25	2.65
C1-------52 to 60	A-7-6(14)	CL	100	100	100	100	100	99	92	36	30	46	23	2.69
Monona silt loam: (S75NE-023-009)														
A1------- 0 to 11	A-7-5(16)	MH	100	100	100	100	100	98	91	32	25	53	23	2.59
B2-------17 to 43	A-7-6(14)	ML	100	100	100	100	100	99	93	36	30	48	20	2.69
C1-------54 to 60	A-7-6(11)	CL	100	100	99	95	94	93	88	32	25	41	18	2.70
Muir silt loam: (S76NE-023-007)														
Ap------- 0 to 6	A-6 (09)	ML	100	100	100	100	99	97	90	28	21	39	12	2.58
B2-------20 to 28	A-7-6(11)	ML	100	100	100	100	100	99	93	33	29	42	16	2.66
C1-------36 to 44	A-4 (81)	ML	100	100	100	100	100	97	88	19	17	31	6	2.64

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Alda	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
Barney	Sandy, mixed, mesic Mollic Fluvaquents
Blendon	Coarse-loamy, mixed, mesic Pachic Haplustolls
Boel	Sandy, mixed, mesic Fluvaquentic Haplustolls
Brocksburg	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Pachic Argiustolls
Burchard	Fine-loamy, mixed, mesic Typic Argiudolls
Butler	Fine, montmorillonitic, mesic Abruptic Argiaquolls
Coly	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Cozad	Coarse-silty, mixed, mesic Fluventic Haplustolls
Crofton	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Fillmore	Fine, montmorillonitic, mesic Typic Argialbolls
Gibbon	Fine-silty, mixed (calcareous), mesic Fluvaquentic Haplaquolls
Grigston	Fine-silty, mixed, mesic Fluventic Haplustolls
Hall	Fine-silty, mixed, mesic Pachic Argiustolls
Hastings	Fine, montmorillonitic, mesic Udic Argiustolls
Hobbs	Fine-silty, mixed, nonacid, mesic Mollic Ustifluvents
Holder	Fine-silty, mixed, mesic Udic Argiustolls
Inavale	Sandy, mixed, mesic Typic Ustifluvents
Judson	Fine-silty, mixed, mesic Cumulic Hapludolls
Kezan	Fine-silty, mixed, nonacid, mesic Mollic Fluvaquents
Lamo	Fine-silty, mixed (calcareous), mesic Cumulic Haplaquolls
*Longford	Fine, montmorillonitic, mesic Udic Argiustolls
Monona	Fine-silty, mixed, mesic Typic Hapludolls
Muir	Fine-silty, mixed, mesic Cumulic Haplustolls
Olbut	Fine, montmorillonitic, mesic Abruptic Argiaquolls
Ovina	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
*Pawnee	Fine, montmorillonitic, mesic Aquic Argiudolls
*Ponca	Fine-silty, mixed, mesic Typic Hapludolls
Saltine	Fine-silty, mixed, mesic Typic Halaquepts
Scott	Fine, montmorillonitic, mesic Typic Argialbolls
Sharpsburg	Fine, montmorillonitic, mesic Typic Argiudolls
Silver Creek	Fine, mixed, mesic Typic Natraquolls
Simeon	Mixed, mesic Typic Ustipsamments
Steinauer	Fine-loamy, mixed (calcareous), mesic Typic Udorthents
Thurman	Sandy, mixed, mesic Udorthentic Haplustolls
Uly	Fine-silty, mixed, mesic Typic Haplustolls
Uly Variant	Fine-silty, mixed, mesic Udic Ustochrepts
Wood River	Fine, montmorillonitic, mesic Typic Natrustolls
Zook	Fine, montmorillonitic, mesic Cumulic Haplaquolls

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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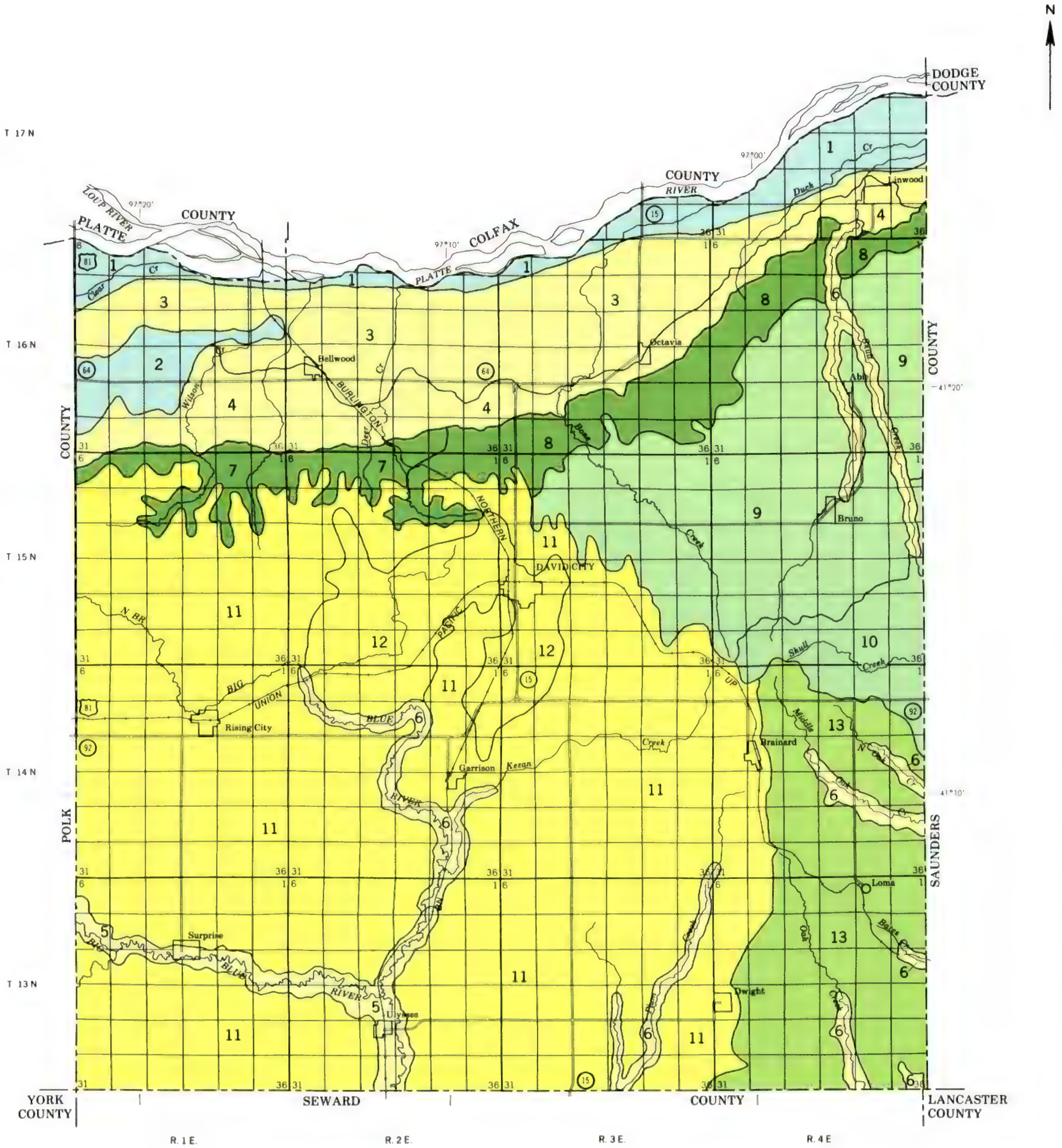


SOIL LEGEND*

LOAMY AND SANDY SOILS ON BOTTOM LANDS AND STREAM TERRACES

1 Alda-Boel-Barney association: Nearly level, somewhat poorly drained and poorly drained loamy soils that formed in alluvium; on bottom lands

2 Brocksburg-Simeon-Thurman association: Nearly level to gently sloping, well drained to excessively drained loamy and sandy soils that formed in loamy and sandy material; on stream terraces

SILTY SOILS ON BOTTOM LANDS, FOOT SLOPES, AND STREAM TERRACES

3 Gibbon-Muir-Zook association: Nearly level, well drained, somewhat poorly drained, and poorly drained silty soils that formed in alluvium; on bottom lands and stream terraces

4 Muir-Grigston-Cozad association: Nearly level and very gently sloping, well drained silty soils that formed in loess, alluvium, or colluvium; on stream terraces, foot slopes, and bottom lands

5 Hall-Muir-Hobbs association: Nearly level and very gently sloping, well drained silty soils that formed in alluvium and loess; on stream terraces, foot slopes, and bottom lands

6 Hobbs-Kezan-Muir association: Nearly level and very gently sloping, well drained and poorly drained silty soils that formed in alluvium and loess; on bottom lands, foot slopes, and stream terraces

SILTY SOILS ON UPLAND BREAKS

7 Uly-Coly association: Moderately steep to very steep, well drained to excessively drained silty soils that formed in loess; on upland breaks

8 Crofton-Monona association: Gently sloping to very steep, well drained to excessively drained silty soils that formed in loess; on upland breaks

SILTY, NEARLY LEVEL TO STEEP SOILS ON UPLANDS

9 Ponca-Sharpsburg association: Nearly level to steep, well drained and moderately well drained silty soils that formed in loess; on uplands

10 Sharpsburg association: Nearly level to strongly sloping, moderately well drained silty soils that formed in loess; on uplands

SILTY, NEARLY LEVEL TO STRONGLY SLOPING SOILS ON UPLANDS

11 Hastings-Butler association: Nearly level to strongly sloping, well drained and somewhat poorly drained silty soils that formed in loess; on uplands

12 Butler-Hastings association: Nearly level to gently sloping, somewhat poorly drained and well drained silty soils that formed in loess; on uplands

SILTY AND LOAMY SOILS ON UPLANDS

13 Sharpsburg-Steinauer-Pawnee association: Gently sloping to very steep, moderately well drained to excessively drained silty and loamy soils that formed in loess and glacial till; on uplands

*Texture terms refer to the surface layer of the major soils.

Compiled 1981

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
UNIVERSITY OF NEBRASKA
CONSERVATION AND SURVEY DIVISION

GENERAL SOIL MAP

BUTLER COUNTY, NEBRASKA

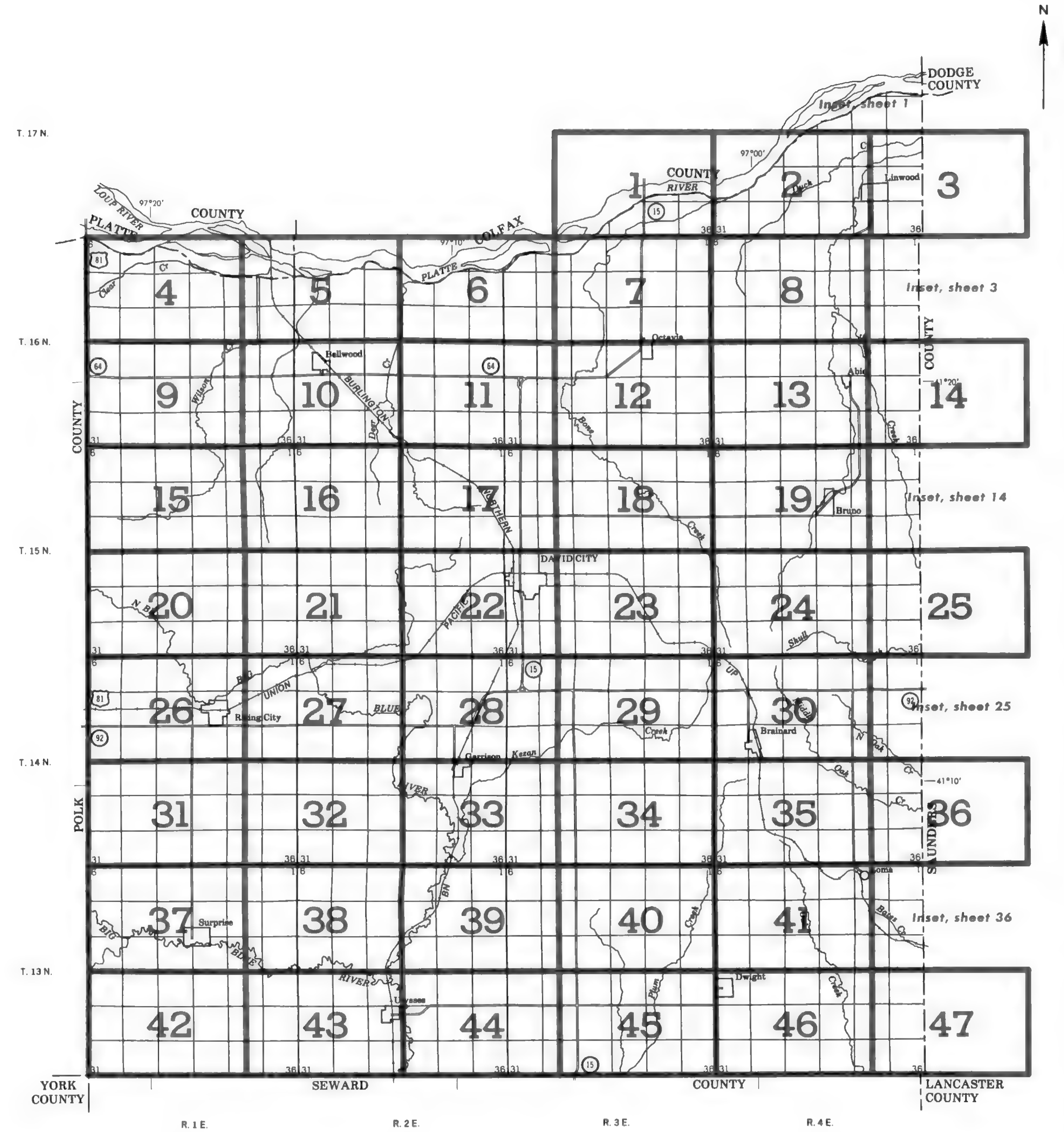
Scale 1:190,080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36



INDEX TO MAP SHEETS
BUTLER COUNTY, NEBRASKA

Scale 1:190,080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and numbers. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 indicates that the soil is eroded.

SYMBOL	NAME
Af	Alda fine sandy loam 0 to 2 percent slopes
Ba	Barney loam 0 to 2 percent slopes
Bd	Blendon fine sandy loam 0 to 2 percent slopes
BdC	Blendon fine sandy loam 2 to 6 percent slopes
Bf	Blendon-Muir complex 0 to 2 percent slopes
Bh	Boel loam 0 to 2 percent slopes
Bn	Boel-Alda complex 0 to 2 percent slopes
Br	Brocksburg sandy loam 0 to 2 percent slopes
BsD	Burchard loam 6 to 11 percent slopes
BsE	Burchard loam 11 to 15 percent slopes
BtE2	Burchard Steinauer clay loams 11 to 15 percent slopes eroded
Bu	Butler silt loam 0 to 1 percent slopes
CfG	Coly silt loam 30 to 60 percent slopes
CoB	Cozad silt loam 1 to 3 percent slopes
CrD2	Crofton silt loam 6 to 11 percent slopes eroded
CrE2	Crofton silt loam 11 to 17 percent slopes eroded
CrF2	Crofton silt loam 17 to 30 percent slopes eroded
CrG	Crofton silt loam 30 to 60 percent slopes
Fm	Fillmore silt loam 0 to 1 percent slopes
Gb	Gibbon silty clay loam 0 to 2 percent slopes
Gr	Grigston silt loam 0 to 1 percent slopes
Ha	Hall silt loam 0 to 1 percent slopes
Hc	Hastings silt loam 0 to 1 percent slopes
HcB	Hastings silt loam 1 to 3 percent slopes
HcC	Hastings silt loam 3 to 6 percent slopes
HcD	Hastings silt loam 6 to 11 percent slopes
HdC2	Hastings silty clay loam 3 to 6 percent slopes eroded
HdD2	Hastings silty clay loam 6 to 11 percent slopes eroded
Hg	Hobbs silt loam 0 to 1 percent slopes
HhB	Hobbs silt loam channeled 0 to 3 percent slopes
HkB	Holder silt loam 1 to 3 percent slopes
IfC	Inavale loamy sand 2 to 6 percent slopes
IwC	Inavale-Boel complex 0 to 6 percent slopes
JuC	Judson silt loam 2 to 6 percent slopes
Kz	Kezan silt loam 0 to 2 percent slopes
La	Lamo silty clay loam 0 to 2 percent slopes
LoC2	Longford silty clay loam 2 to 6 percent slopes eroded
LoD2	Longford silty clay loam 6 to 11 percent slopes eroded
MnC	Monona silt loam 2 to 6 percent slopes
MnD2	Monona silt loam 6 to 11 percent slopes eroded
MnE	Monona silt loam 11 to 17 percent slopes
MnF	Monona silt loam 17 to 30 percent slopes
Mu	Muir silt loam 0 to 1 percent slopes
MuB	Muir silt loam 1 to 3 percent slopes
Ob	Olbut Butler silt loams 0 to 1 percent slopes
OvB	Ovina loamy fine sand 0 to 3 percent slopes
Oxc	Ovina Thurman loamy fine sands 0 to 6 percent slopes
PaC2	Pawnee clay loam 3 to 6 percent slopes eroded
PaD2	Pawnee clay loam 6 to 11 percent slopes eroded
Pg	Pits gravel
PoC2	Ponca silty clay loam 2 to 6 percent slopes eroded
PoD2	Ponca silty clay loam 6 to 11 percent slopes eroded
PoE2	Ponca silty clay loam 11 to 17 percent slopes eroded
PsD2	Ponca-Crofton complex 6 to 11 percent slopes eroded
PsE2	Ponca-Crofton complex 11 to 17 percent slopes eroded
PsF2	Ponca Crofton complex 17 to 30 percent slopes eroded
Sa	Saltine Gibbon silt loams 0 to 1 percent slopes
Sc	Scott silt loam 0 to 1 percent slopes
Sh	Sharpsburg silty clay loam 0 to 2 percent slopes
ShC	Sharpsburg silty clay loam 2 to 6 percent slopes
ShC2	Sharpsburg silty clay loam 2 to 6 percent slopes eroded
ShD	Sharpsburg silty clay loam 6 to 11 percent slopes
ShD2	Sharpsburg silty clay loam 6 to 11 percent slopes eroded
Sk	Silver Creek complex 0 to 2 percent slopes
SmB	Simeon loamy sand 0 to 3 percent slopes
StD2	Steinauer clay loam 6 to 11 percent slopes eroded
StF	Steinauer clay loam 11 to 30 percent slopes
StG	Steinauer clay loam 30 to 50 percent slopes
ThC	Thurman loamy find sand 3 to 6 percent slopes
TkD	Thurman Monona complex 6 to 11 percent slopes
UaF2	Uly silt loam 11 to 15 percent slopes eroded
UbF	Uly Coly silt loams 15 to 30 percent slopes
UcF2	Uly-Coly silt loams 15 to 25 percent slopes eroded
UhF2	Uly-Hobbs silt loams 0 to 30 percent slopes eroded
UxC2	Uly Variant silty clay loam 3 to 6 percent slopes eroded
WoB	Wood River silt loam 1 to 3 percent slopes
Zk	Zook silt loam overwash 0 to 2 percent slopes
Zo	Zook silty clay loam 0 to 2 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

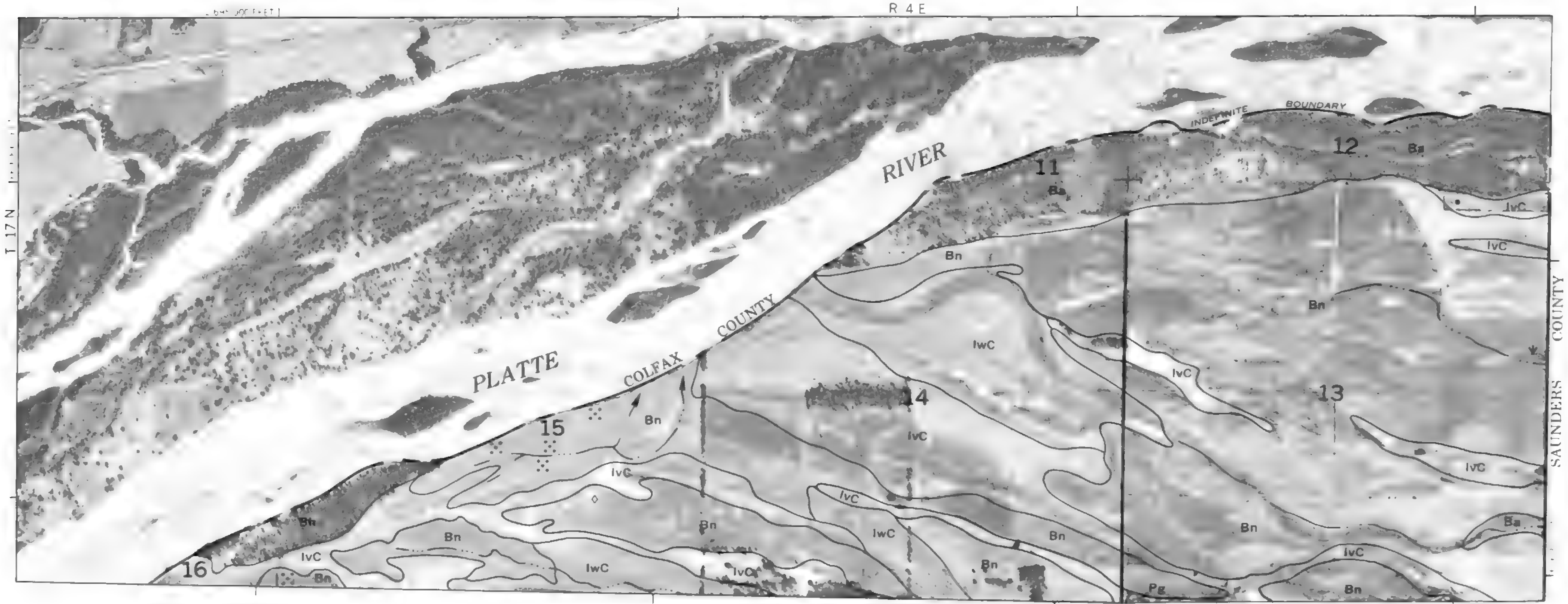
SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

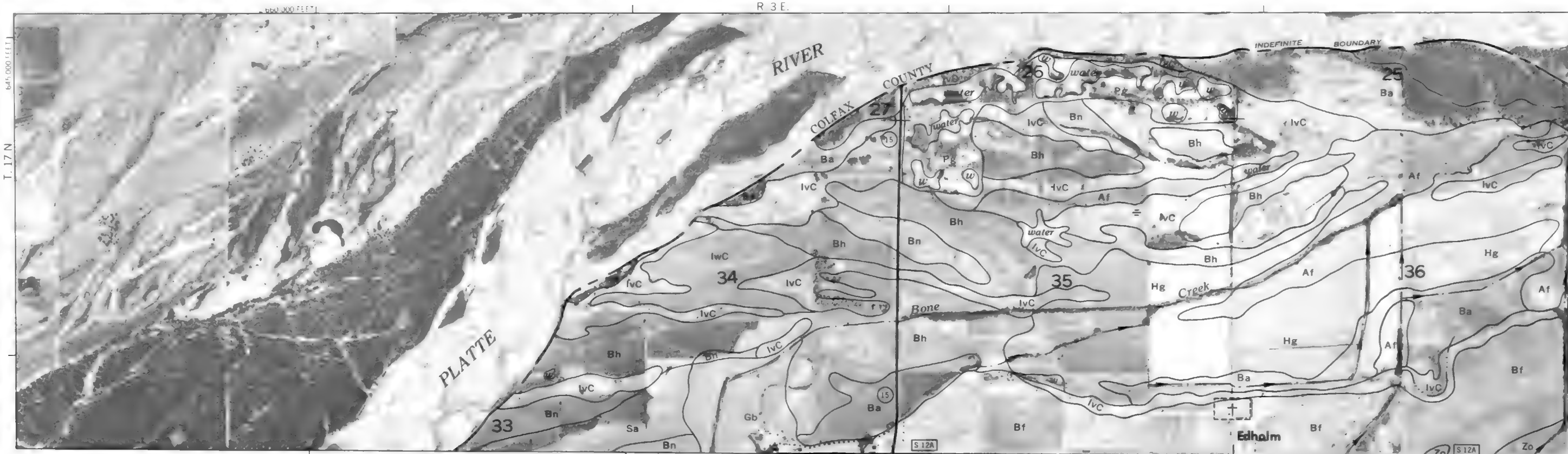
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Cut area (land leveling)
- Reddish brown loess outcrop

1

N



4000 AND 5000 FOOT GRID TICKS



1 Mile

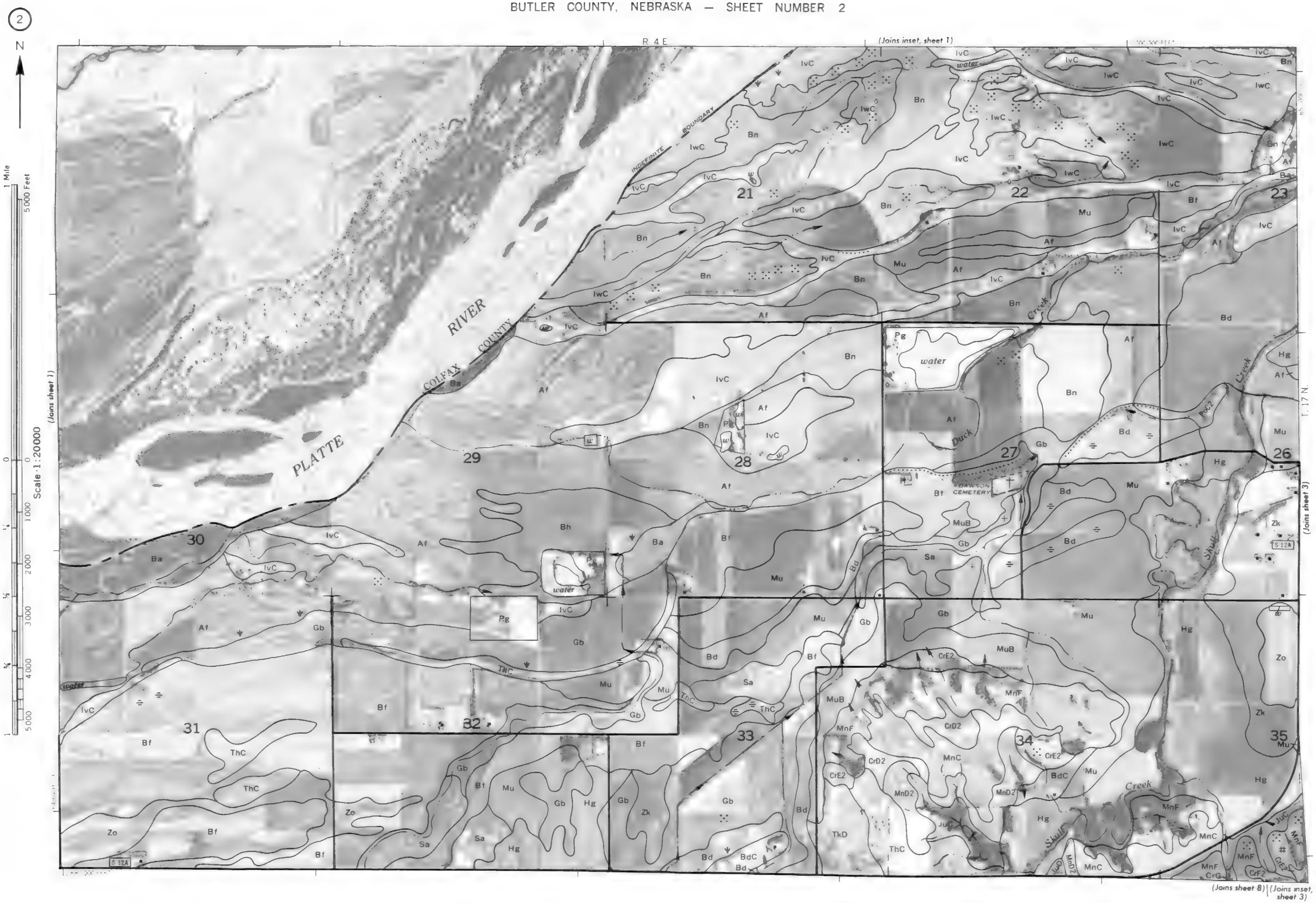
5000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


2
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1 Mile
5000 Feet
Scale 1:20000
R 4 E
(Joins inset, sheet 1)
(Joins sheet 1)
(Joins sheet 3)
T. 17 N.
(Joins sheet 8)
(Joins inset, sheet 3)
PLATTE
RIVER
COLFAX
COUNTY
INDEFINITE
BOUNDARY
DAWSON CEMETERY
Duck
Creek
Skull
Creek
water
21
22
23
26
27
28
29
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31
32
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35

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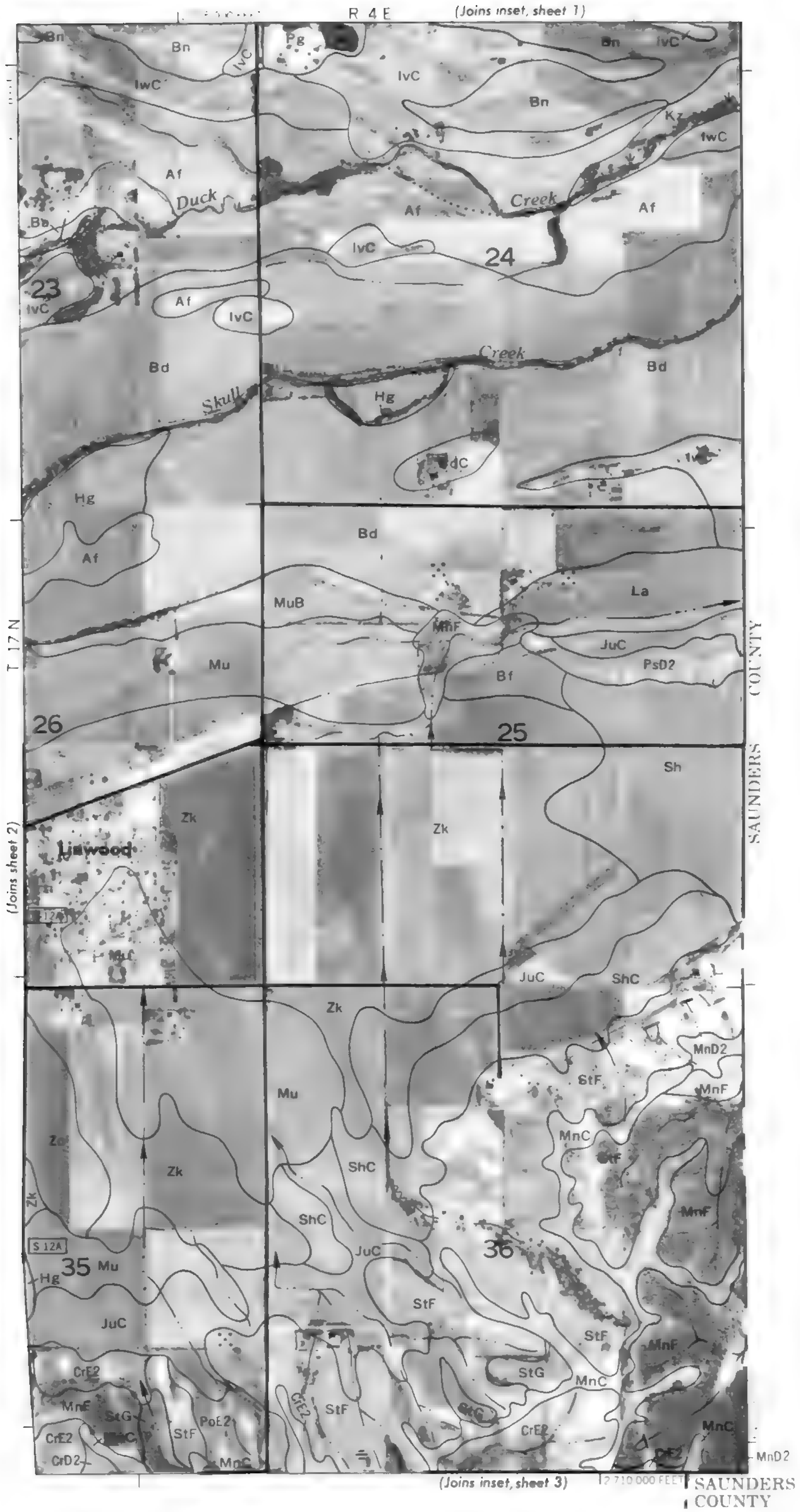

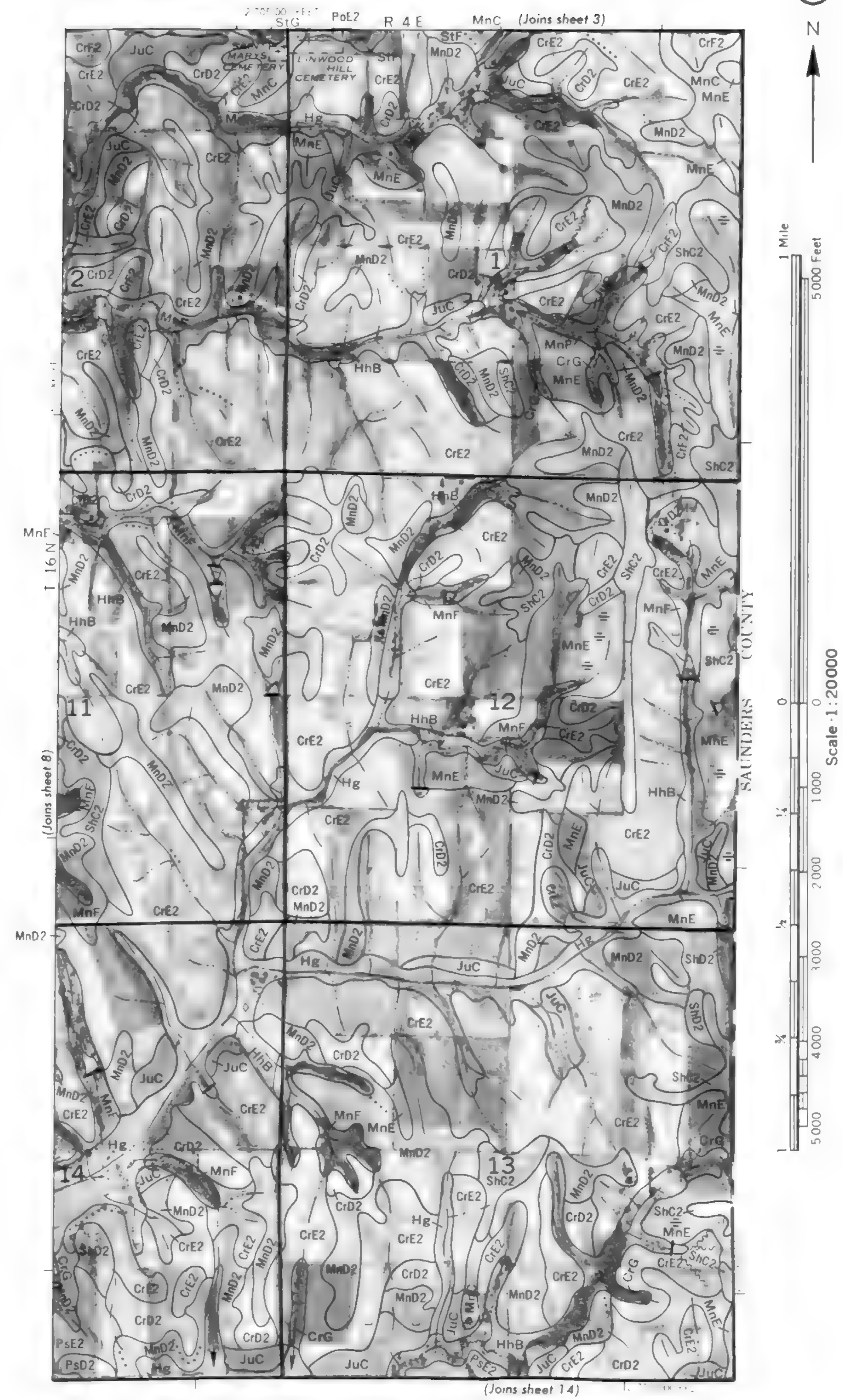

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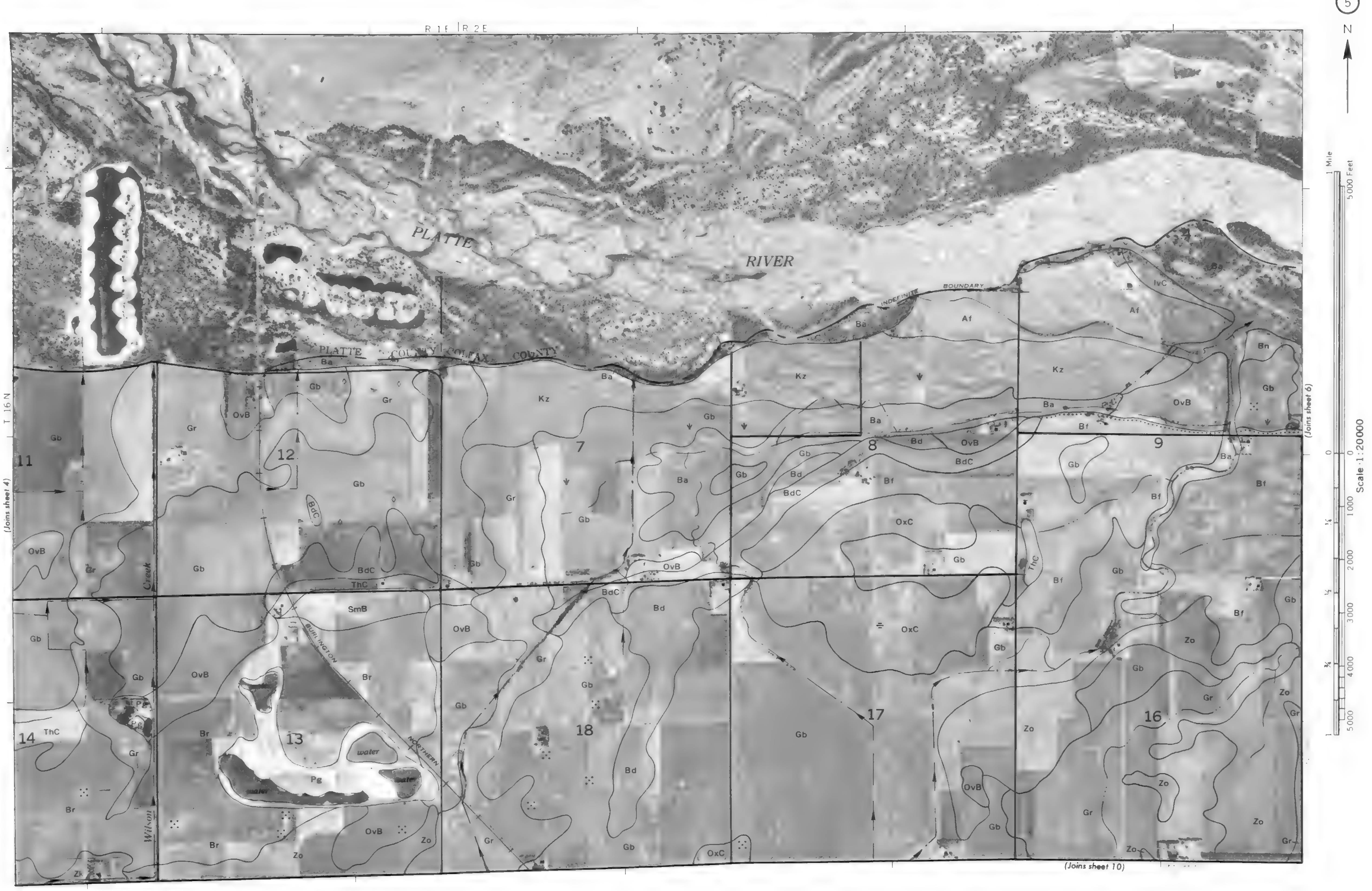

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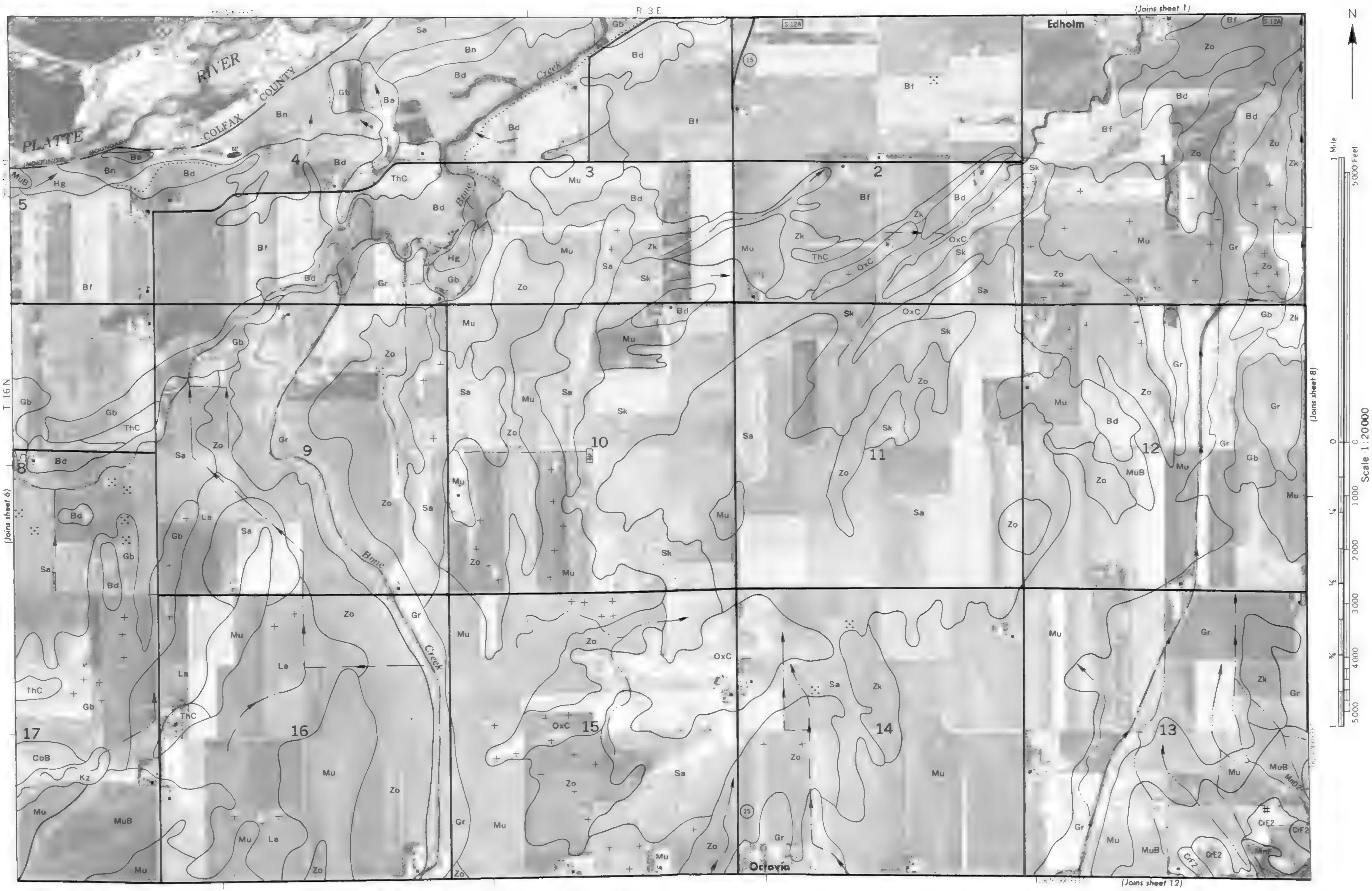
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

7



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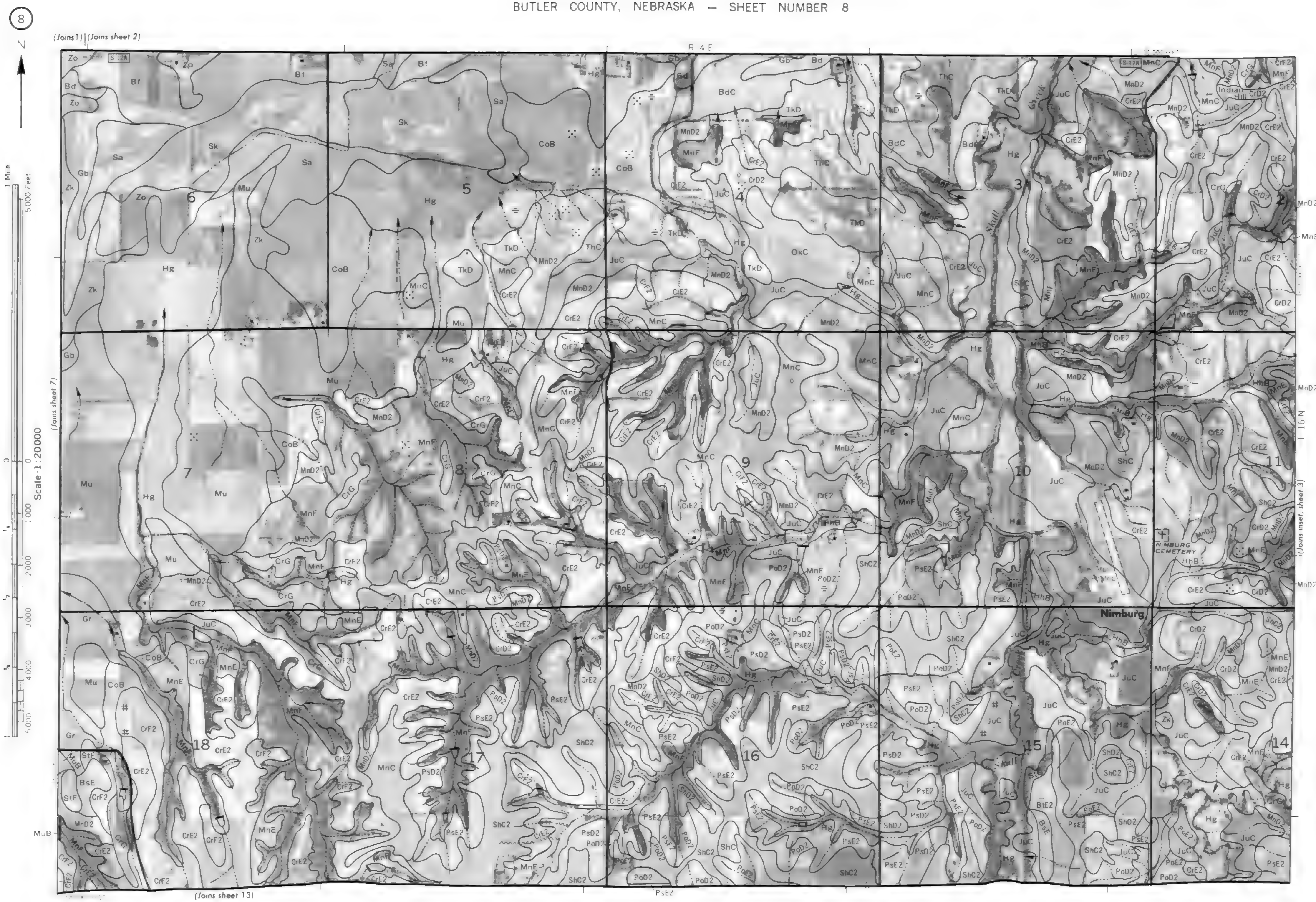
8
N
(Joins 1)
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R 4 E
T 16 N
(Joins sheet 7)
(Joins inset, sheet 3)
(Joins sheet 13)
Scale 1:20000
1 Mile
5000 Feet
Indian Hill
Skull Creek
NIMBURG CEMETERY
Nimburg
S 12A


9
N
R 1 E
(Joins sheet 4)
(Joins sheet 10)
(Joins sheet 15)
T 16 N
POLK COUNTY
SIXTH PRINCIPAL MERIDIAN
SAINT JOSEPH CEMETERY
PLEASANT VIEW CEMETERY
Creek
Wilson
19
20
21
22
23
26
27
28
29
30
31
32
33
34
35
81
64
OvB
Gb
ThC
SmB
Br
Pg
OxC
Zk
Gr
Hg
Mu
Gb
Ha
CoB
JuC
MuB
HhB
UbF
CfG
HkB
UcF2
1 Mile
5000 Feet
Scale 1:20000

10

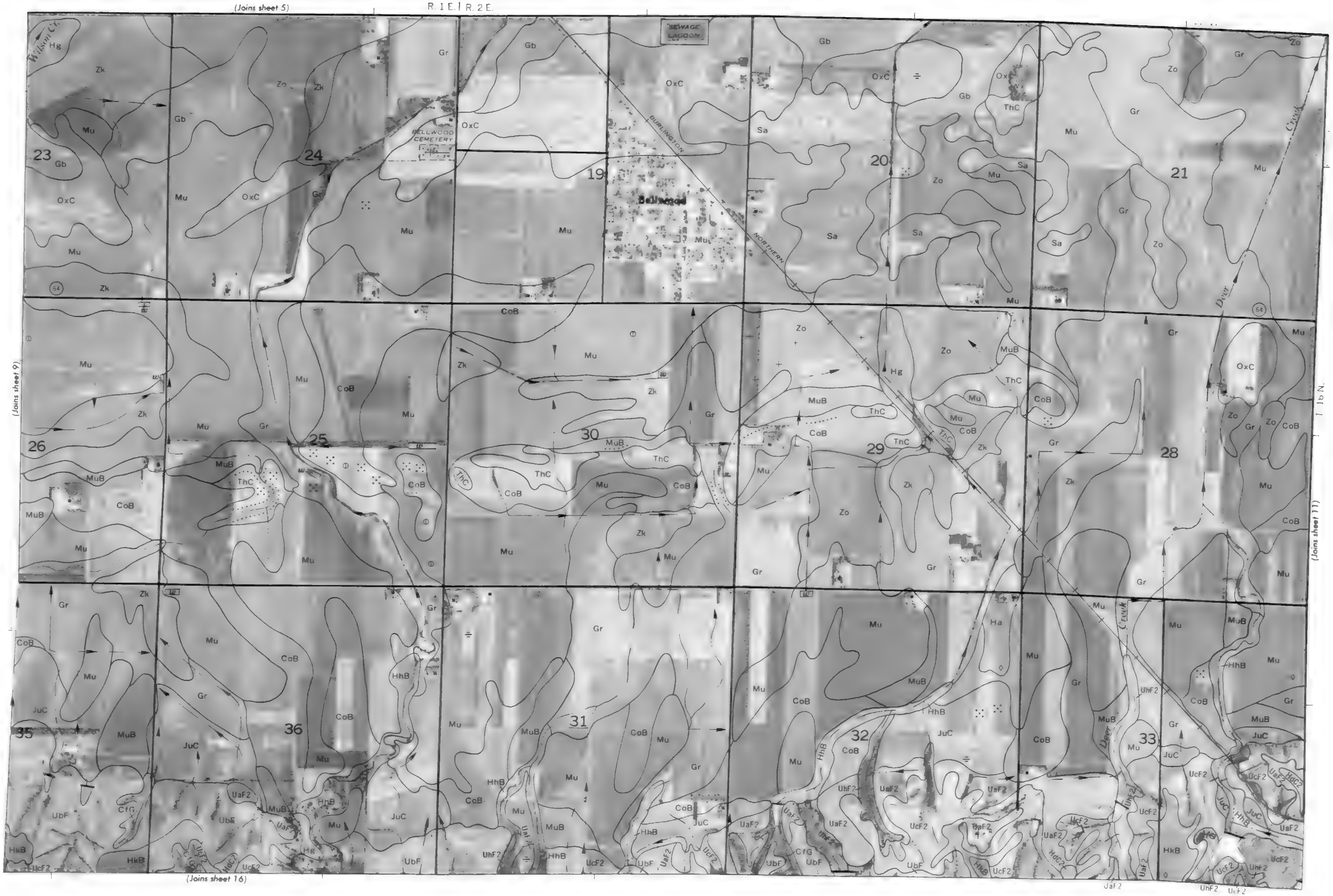
BUTLER COUNTY, NEBRASKA — SHEET NUMBER 10

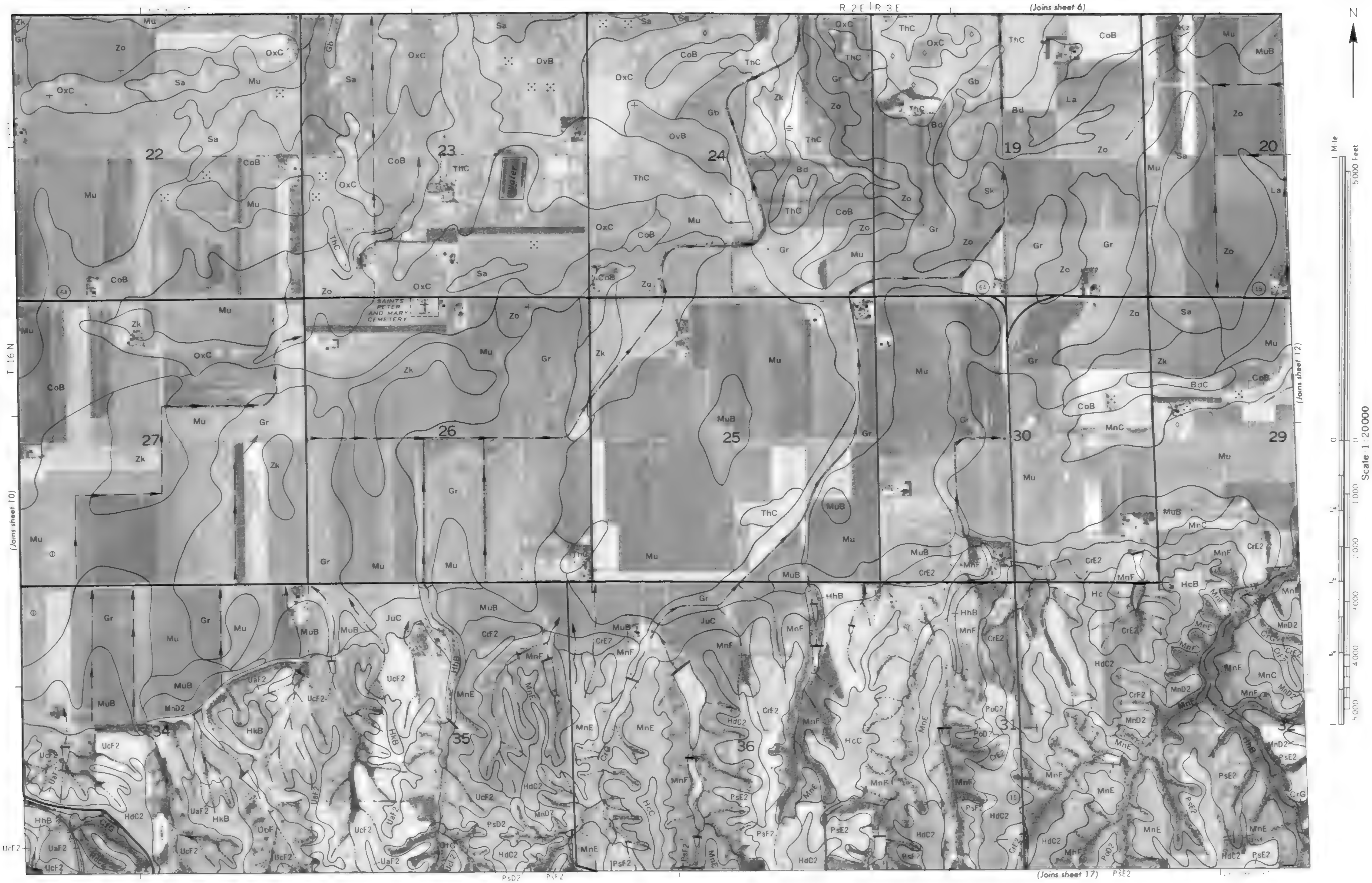
N

1 Mile

5 000 Feet

Scale 1:20000




R 2 E | R 3 E
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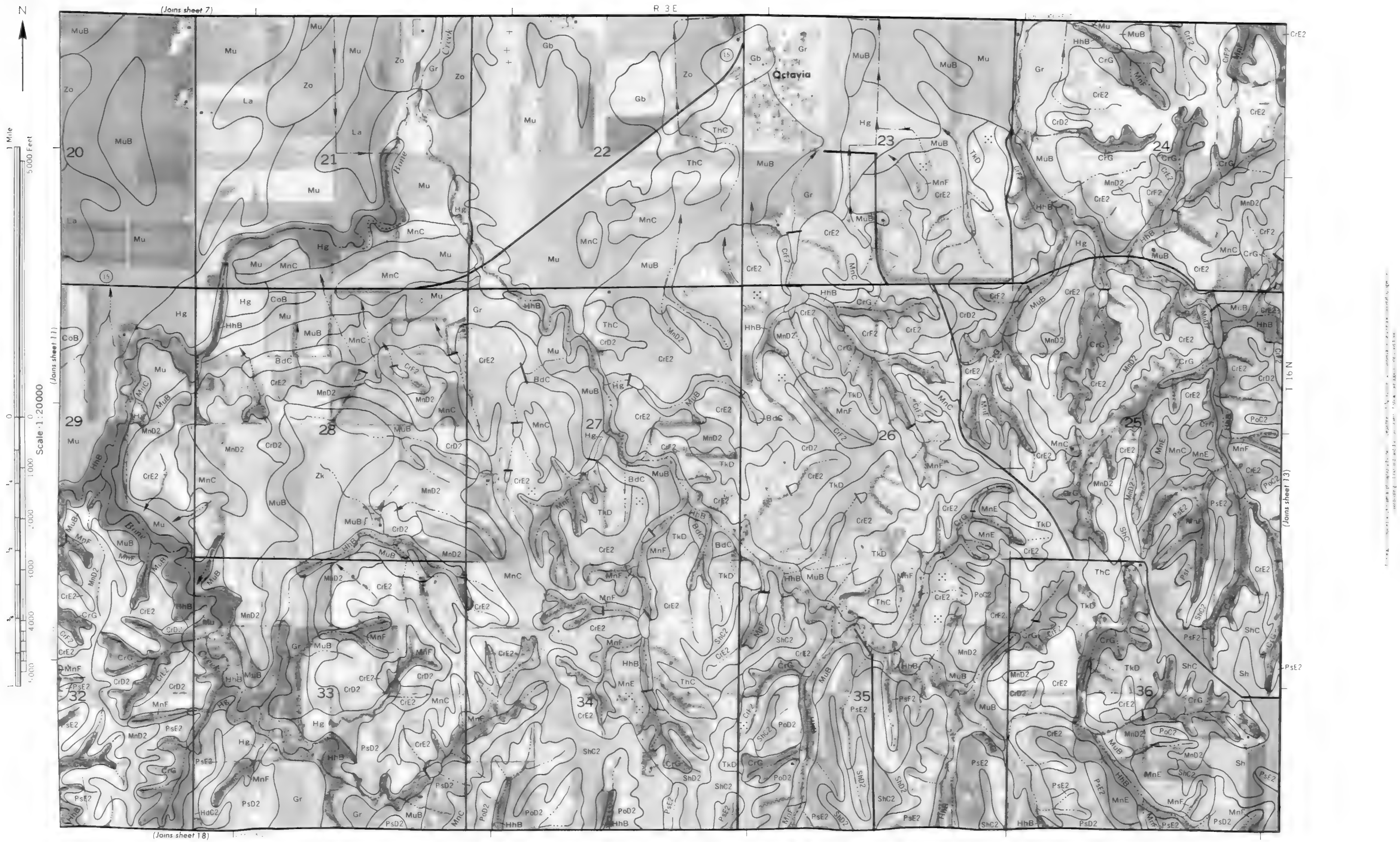
(Joins sheet 10)
(Joins sheet 12)
(Joins sheet 17)
T 16 N
N
SAINTS PETER AND MARY CEMETERY
Water
22
23
24
19
20
27
26
25
30
29
34
35
36
31
32
1 Mile
5000 Feet
Scale 1:20000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R 3 E
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(Joins sheet 13)
(Joins sheet 18)
T 16 N
Octavia
Bone Creek
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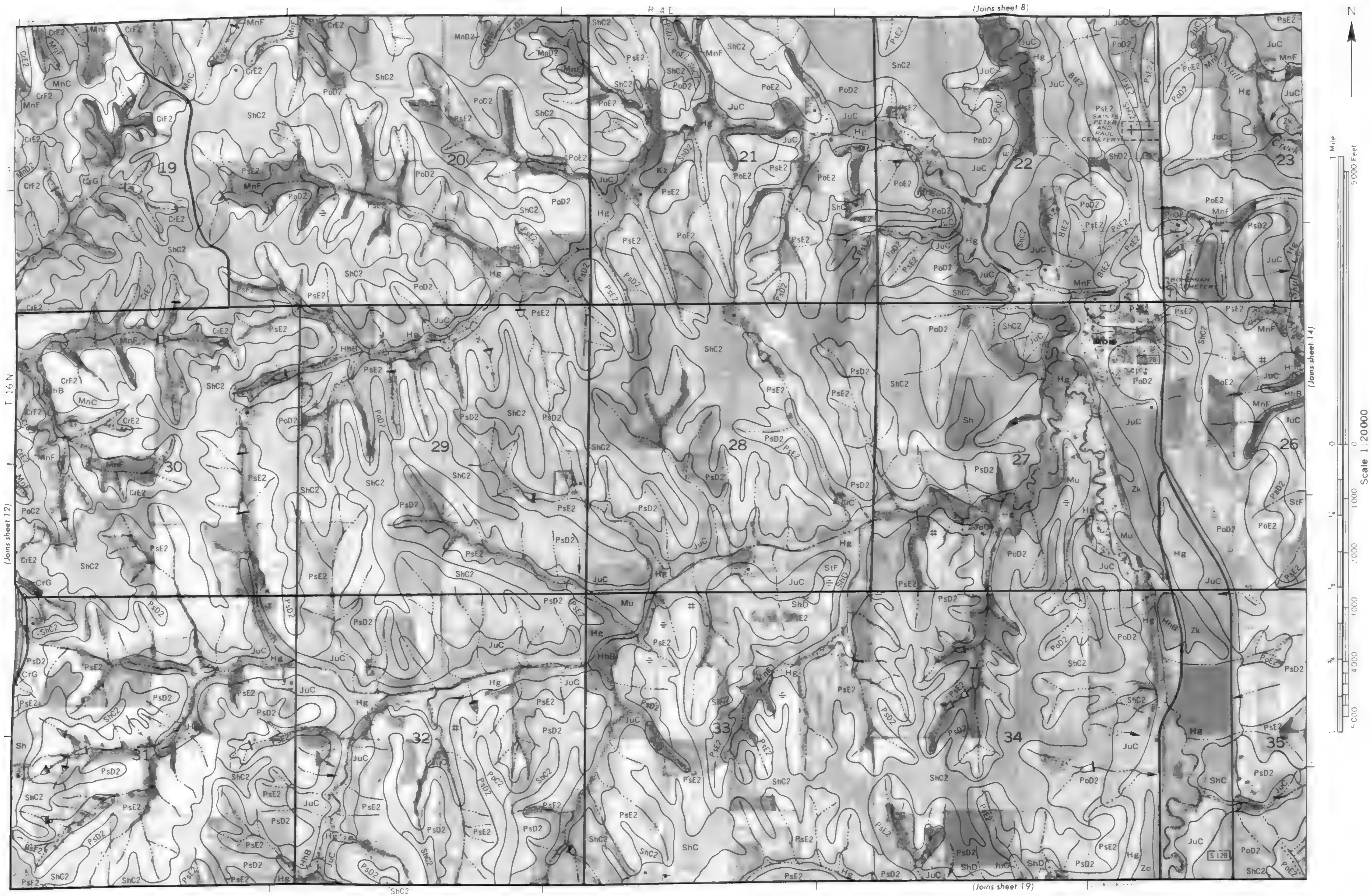
36
1 Mile
5000 Feet
Scale 1:20000

13


R 4 E
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(Joins sheet 12)
(Joins sheet 14)
(Joins sheet 19)
T 16 N
N
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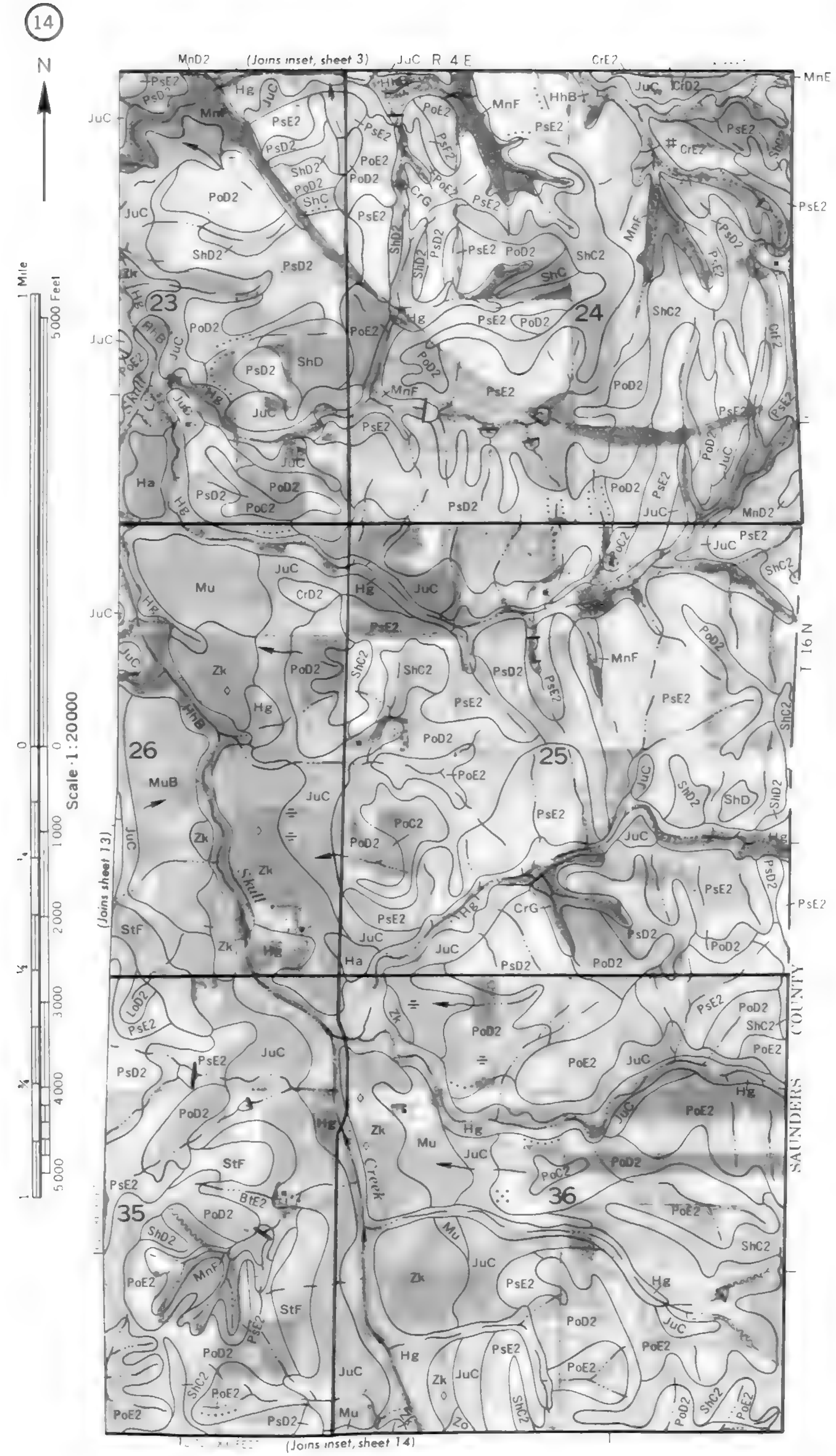
26
31
32
33
34
35
SAINTS PETER AND PAUL CEMETERY
BOHEMIAN CEMETERY
Skull Creek
Abie
1 Mile
5000 Feet
Scale 1:20000


14
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1 Mile
5000 Feet
Scale 1:20000
(Joins inset, sheet 3)
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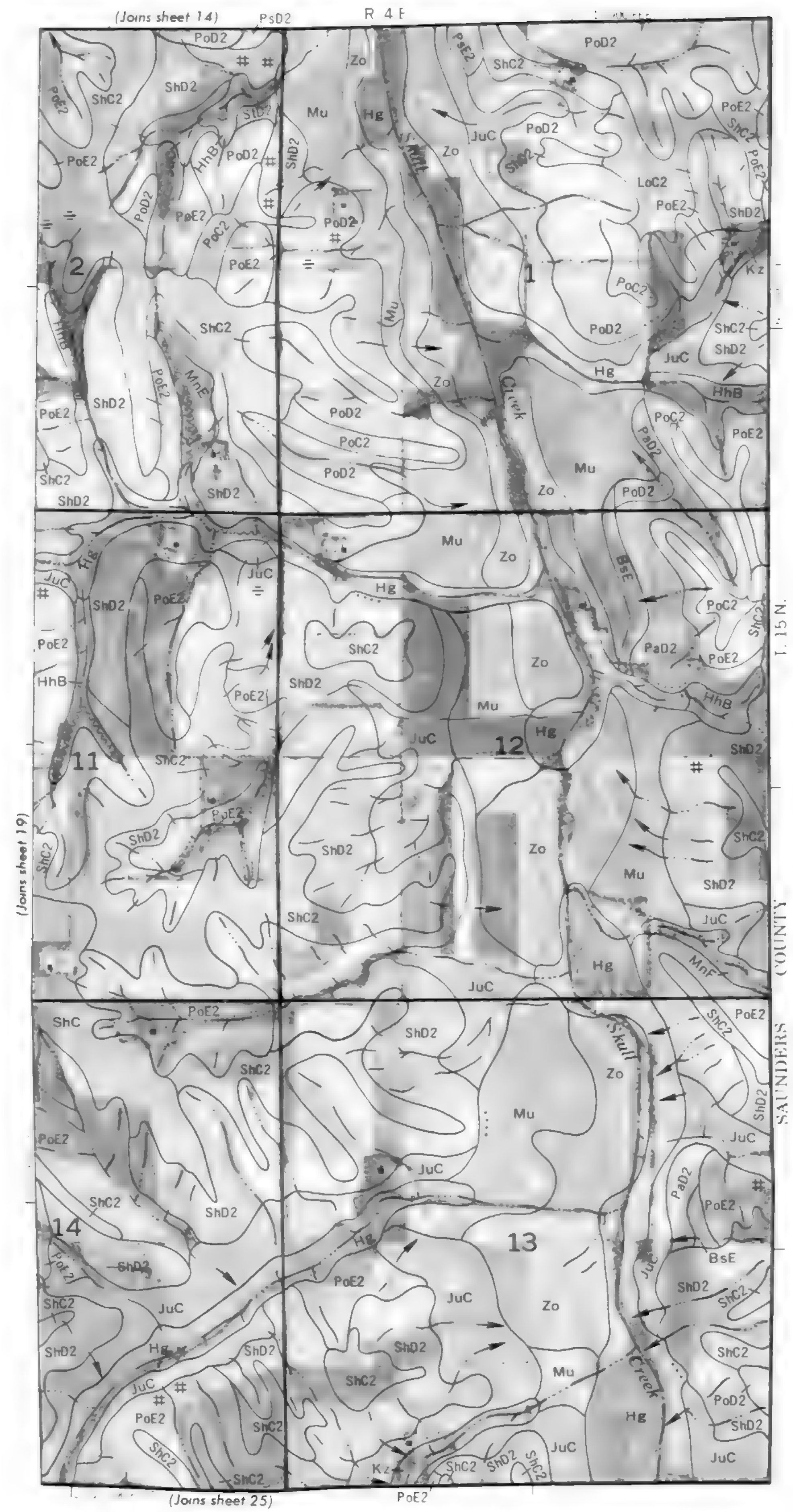
T 16 N
(Joins sheet 13)
SAUNDERS COUNTY
(Joins inset, sheet 14)
23
24
26
25
35
36
Skull Creek


(Joins sheet 14)
R 4 E
T 15 N
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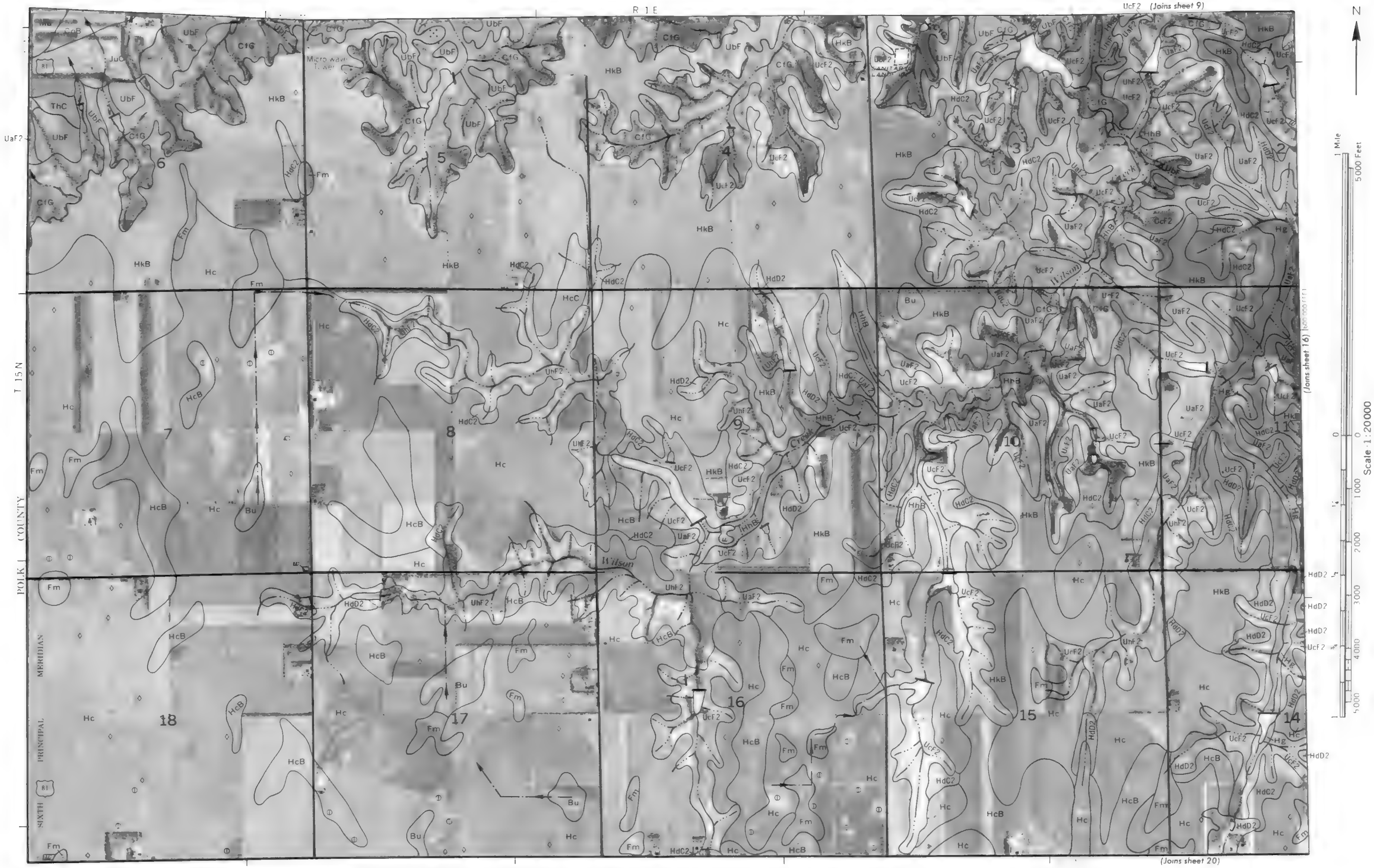
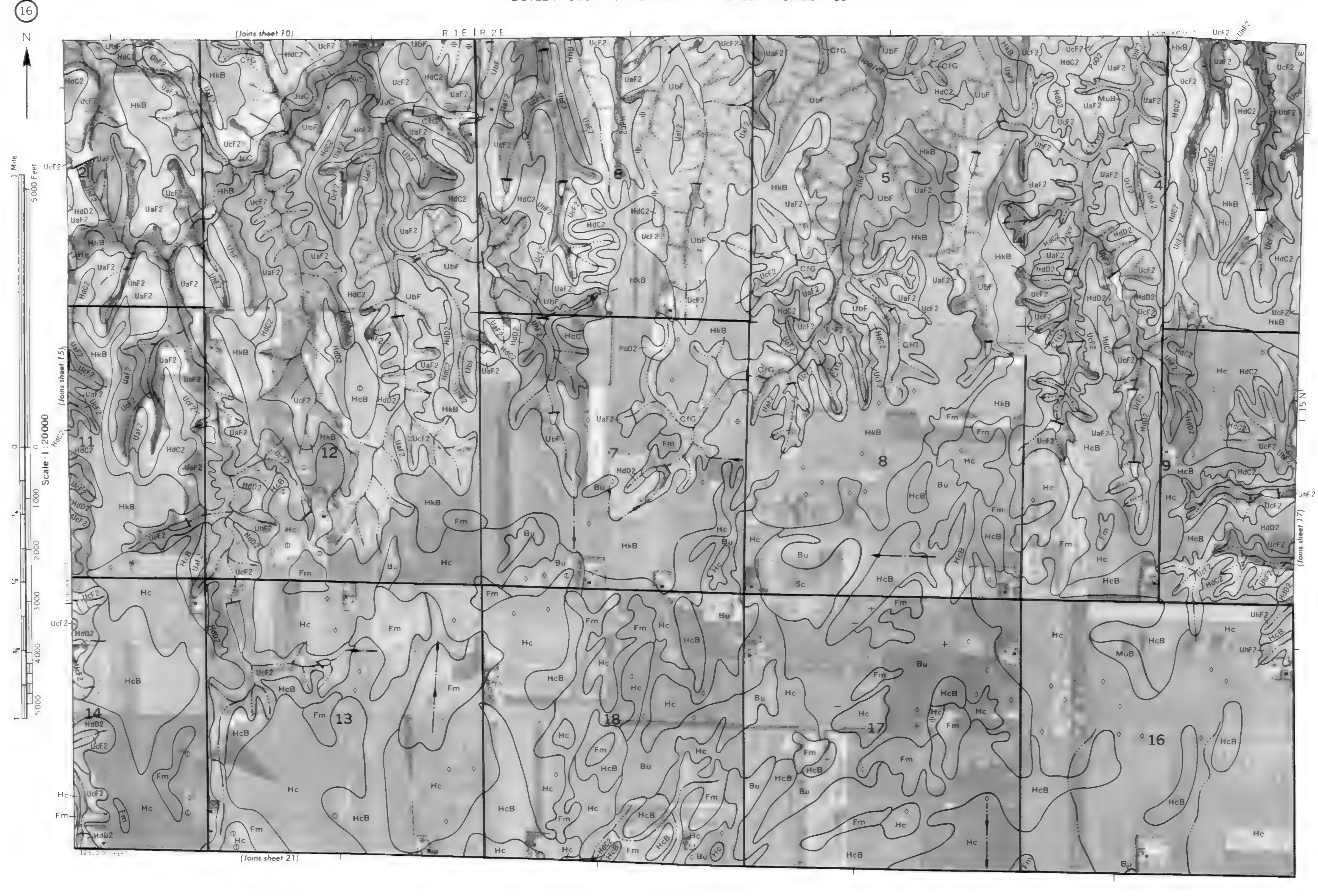
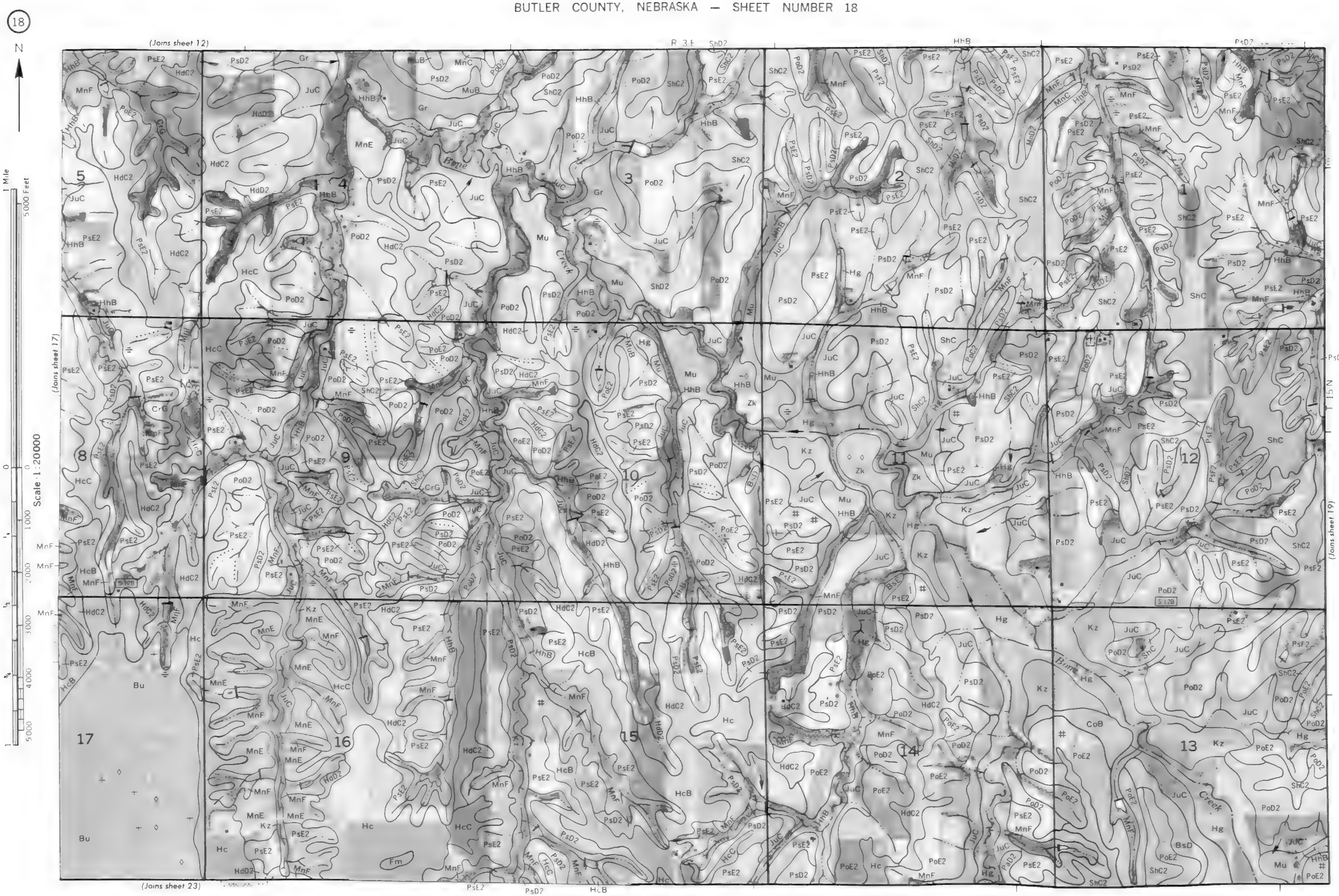
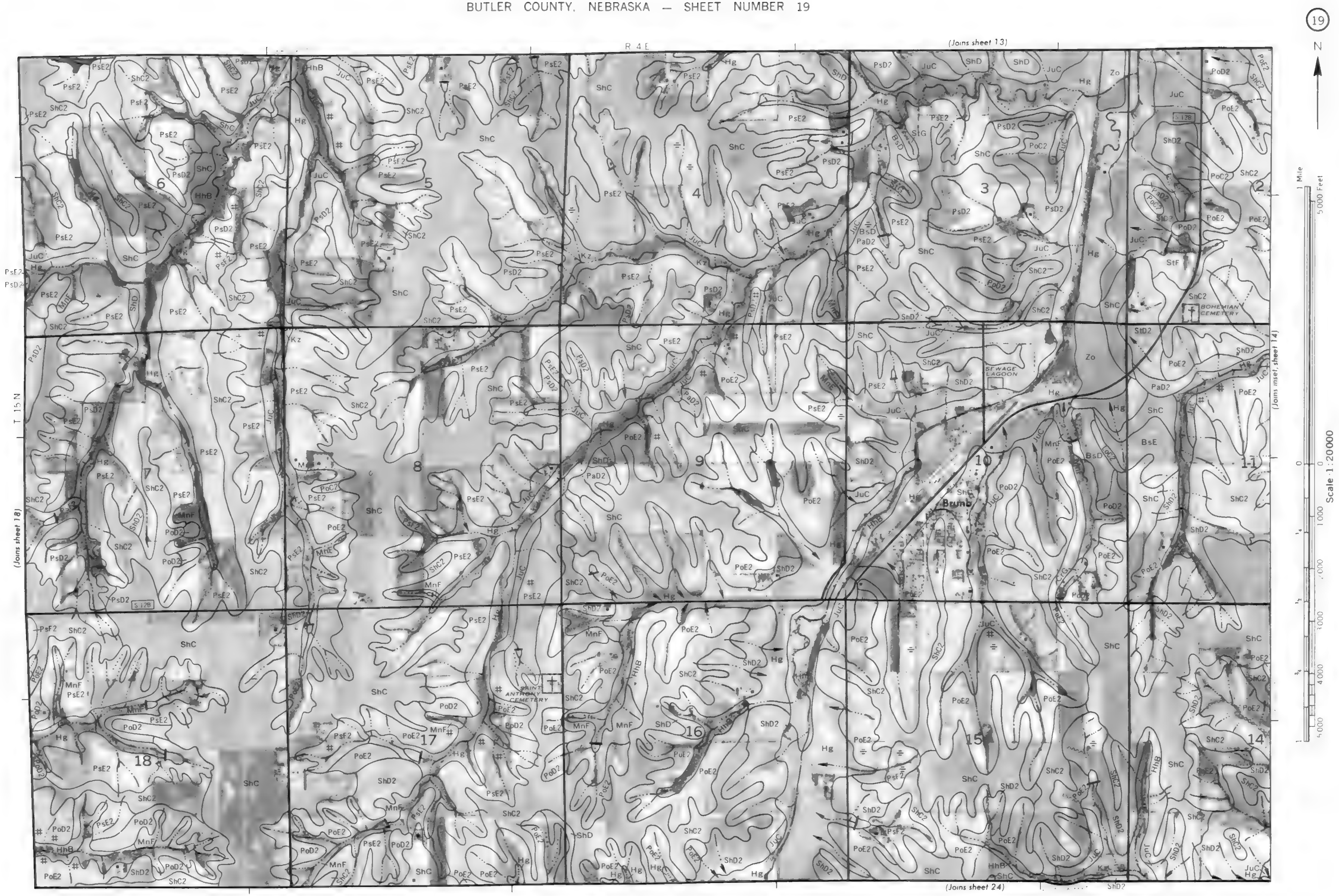
SAUNDERS COUNTY
(Joins sheet 25)
2
1
11
12
14
13
Skull Creek

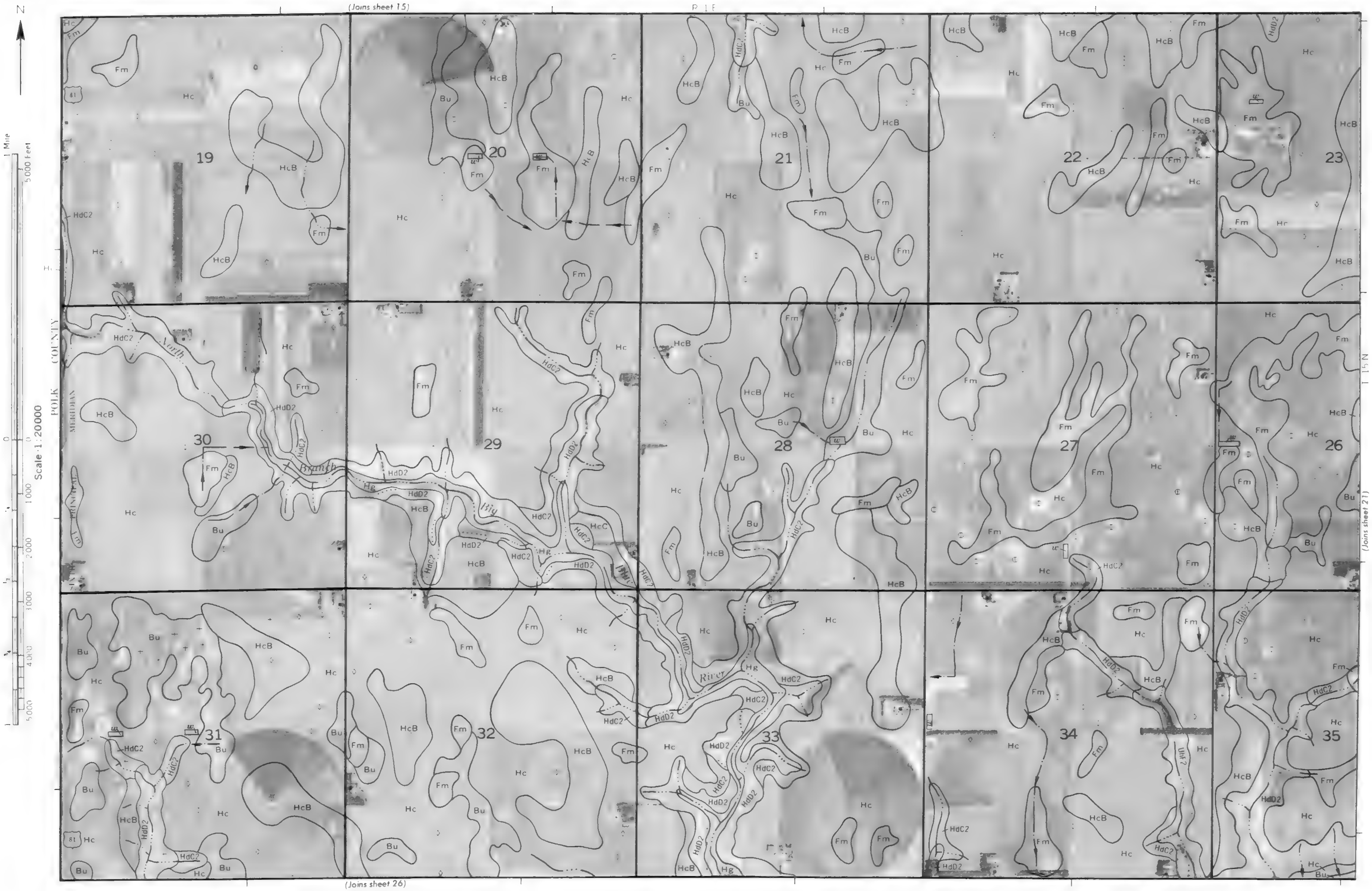

N
R 1 E
T 15 N
POLK COUNTY
SIXTH PRINCIPAL MERIDIAN
UcF2 (Joins sheet 9)
(Joins sheet 16)
(Joins sheet 20)
Micro wave Tower
Wilson
Creek
1 Mile
5000 Feet
Scale 1:20000

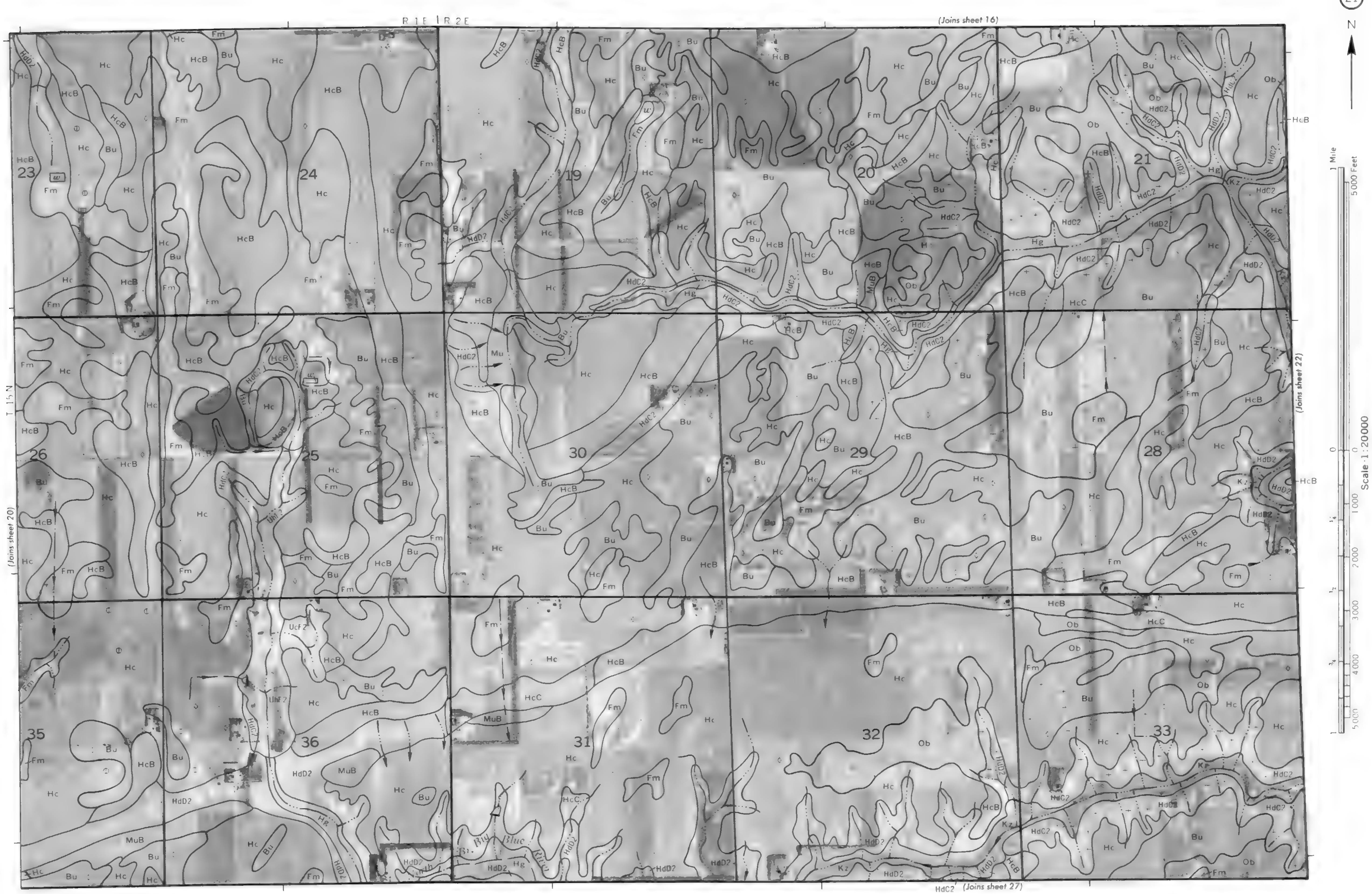

16
N
(Joins sheet 10)
R 1 E | R 2 E
(Joins sheet 15)
(Joins sheet 17)
(Joins sheet 21)
T 15 N
Scale 1:20000
1 Mile
5000 Feet
1
2
4
5
6
7
8
9
11
12
13
14
16
17
18

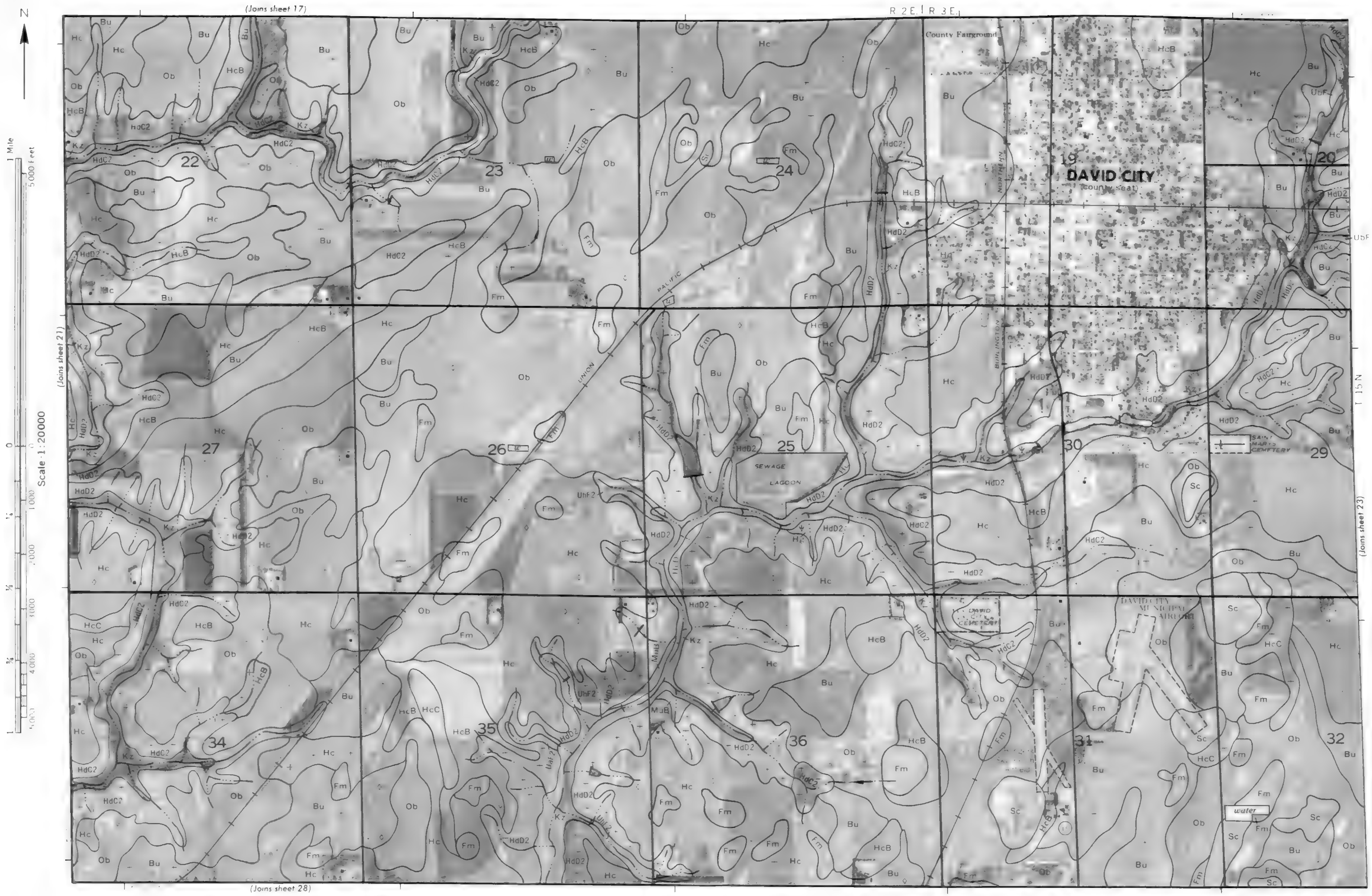

17
N
(Joins sheet 11)
R 2 E | R 3 E
T 15 N
(Joins sheet 16)
(Joins sheet 18)
(Joins sheet 22)
BURLINGTON
NORTHERN
SANITARY LANDFILL
1 Mile
5000 Feet
Scale 1:20000

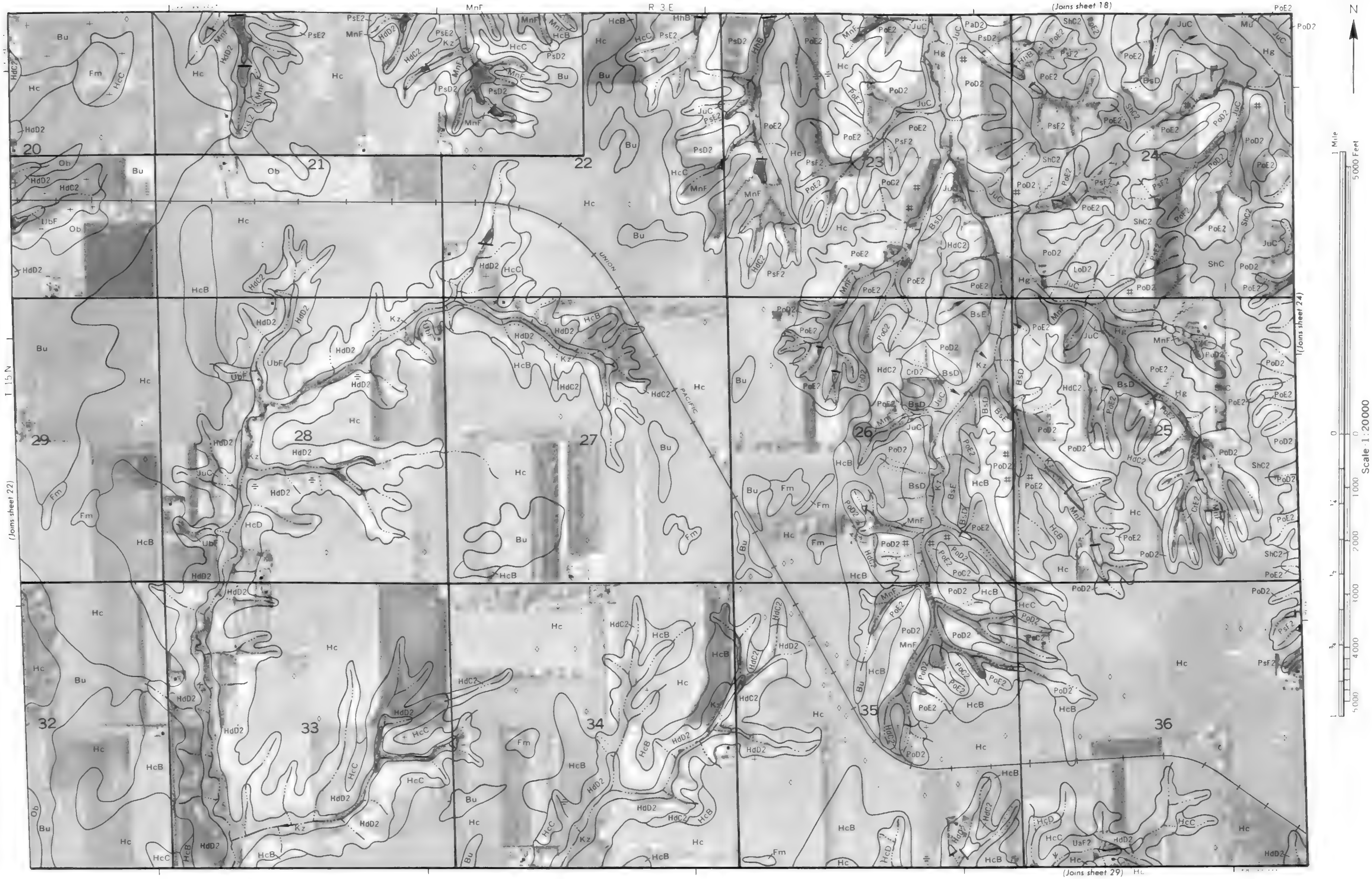

18
N
(Joins sheet 12)
(Joins sheet 17)
(Joins sheet 19)
(Joins sheet 23)
1 Mile
5000 Feet
Scale 1:20000
R. 3 E.
T. 15 N.
Bone Creek

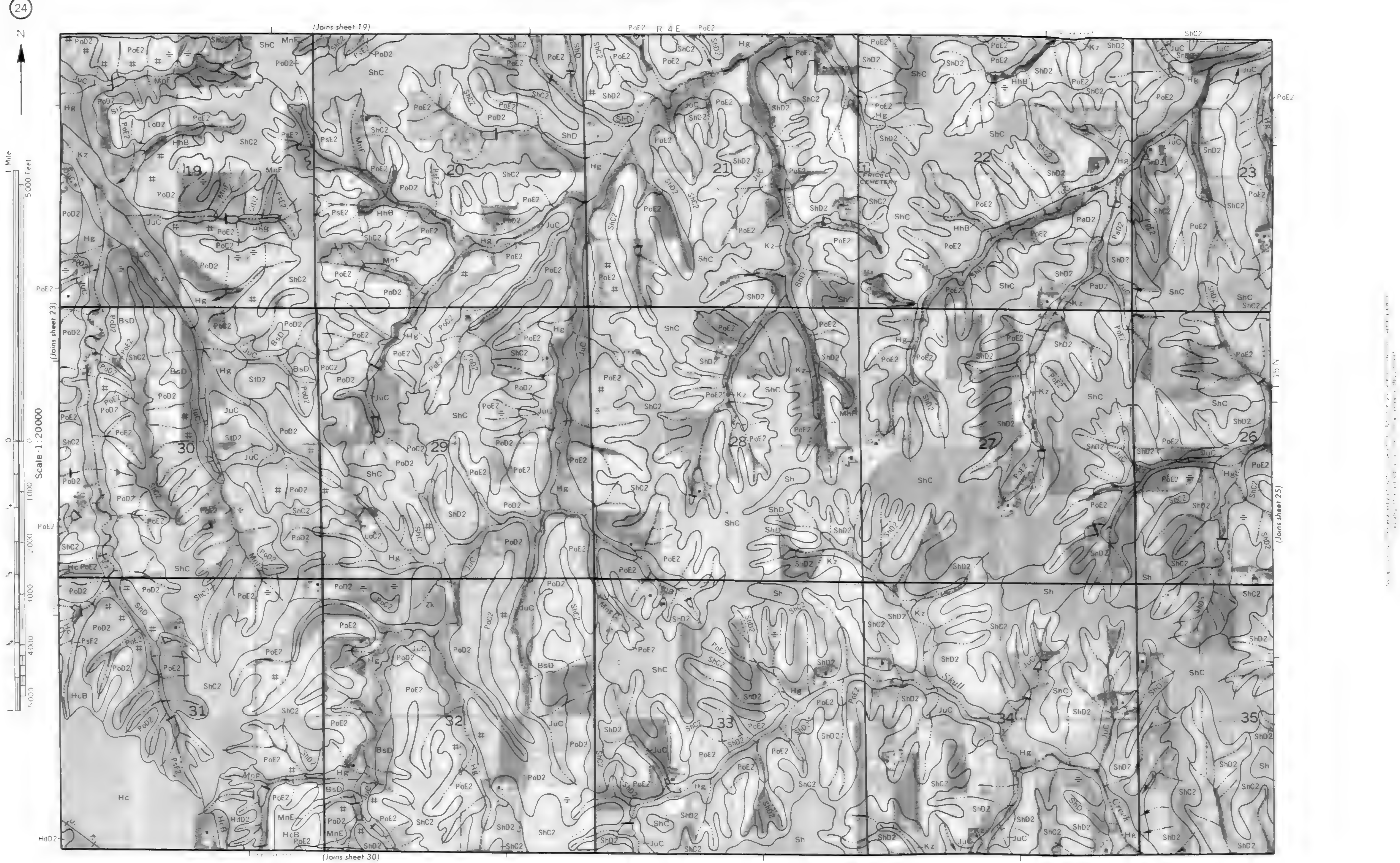

19
N
(Joins sheet 13)
(Joins sheet 24)
(Joins sheet 18)
(Joins inset, sheet 14)
R 4 E
T 15 N
1 Mile
5000 Feet
Scale 1:20000
SEWAGE LAGOON
BOHEMIAN CEMETERY
SAINT ANTHONY CEMETERY
Brumb
1
2
3
4
5
6
7
8
9
10
11
14
15
16
17
18

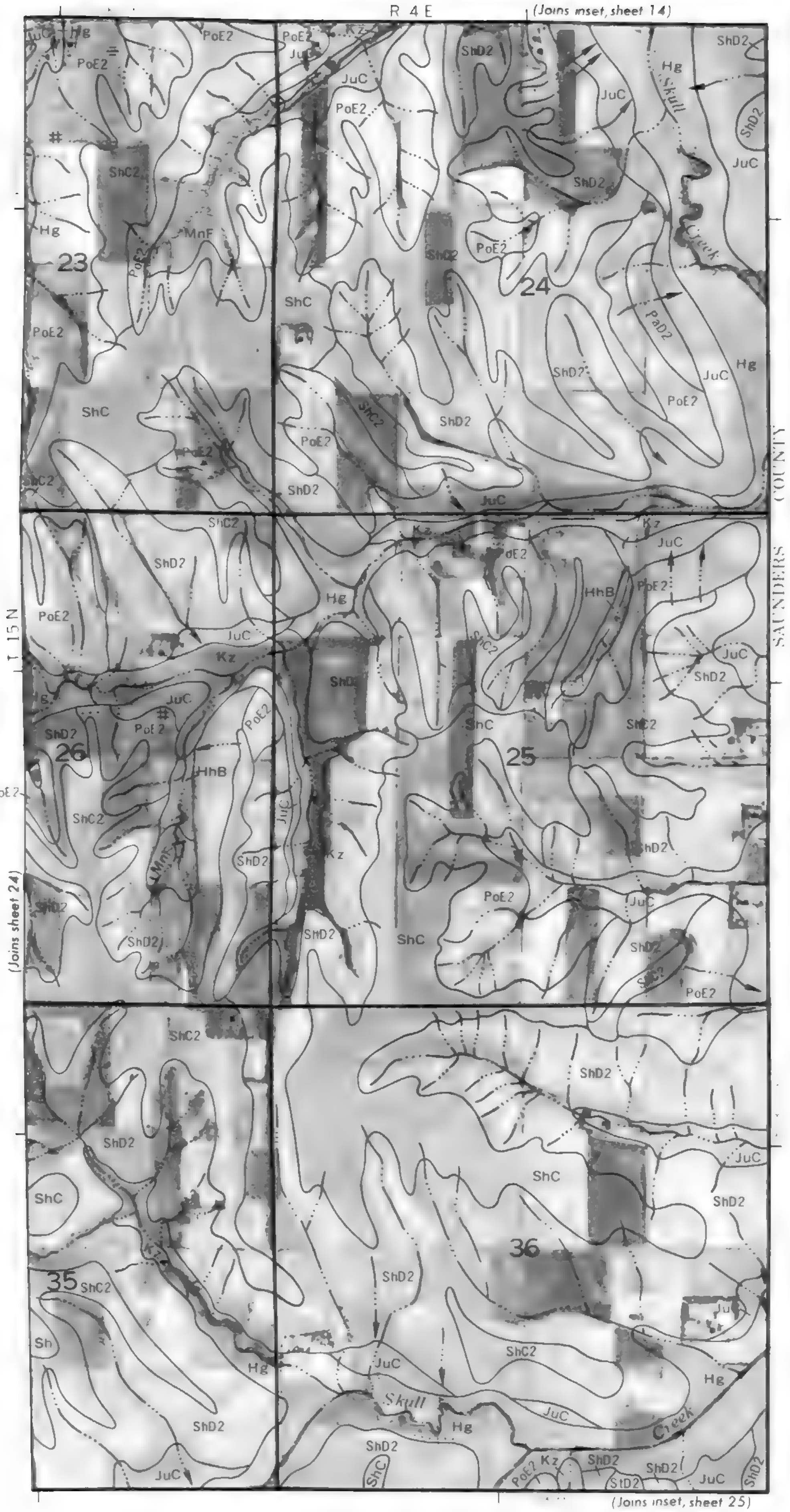

N
(Joins sheet 15)
(Joins sheet 26)
(Joins sheet 21)
Scale 1:20000
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
POLK COUNTY
R. 1 E.
T. 15 N.
19
20
21
22
23
30
29
28
27
26
31
32
33
34
35
North Branch
Big
River
Hc
HcB
Fm
Bu
HdC2
HdD2
Hg
HcC
81

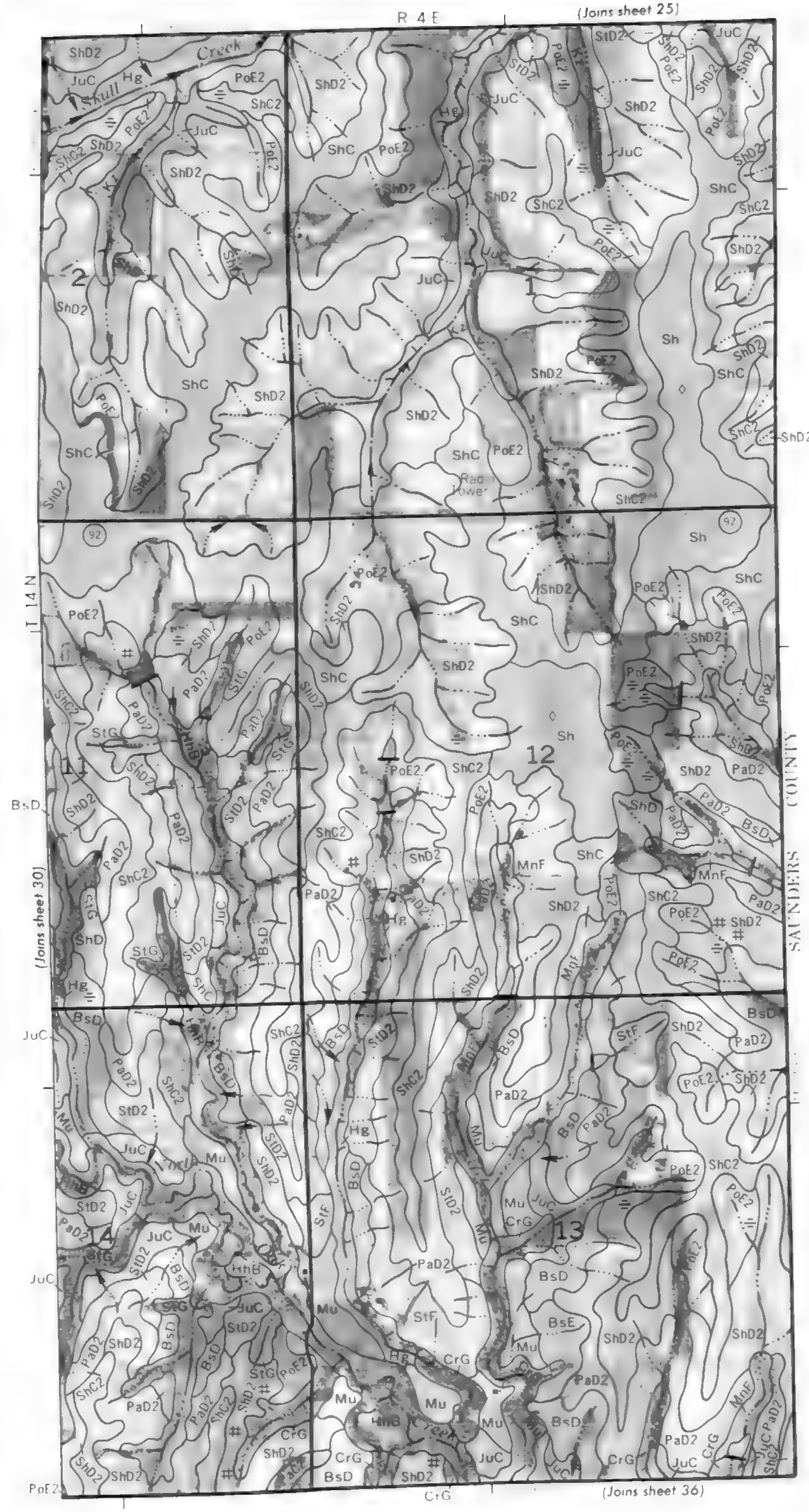

21
N
R 1 E
R 2 E
T 15 N
(Joins sheet 16)
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 27)
23
24
19
20
21
26
25
30
29
28
35
36
31
32
33
Big Blue River
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
Scale 1:20000


N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 17)
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 28)
R 2 E. | R 3 E.
T 15 N
County Fairground
DAVID CITY
(county seat)
SEWAGE
LAGOON
SAINT MARYS CEMETERY
DAVID CITY CEMETERY
DAVID CITY MUNICIPAL AIRPORT
water
UNION
PACIFIC
BURLINGTON NORTHERN
19
20
22
23
24
25
26
27
29
30
31
32
34
35
36


23
N
(Joins sheet 18)
(Joins sheet 24)
(Joins sheet 29)
(Joins sheet 22)
R 3 E
T 15 N
1 Mile
5000 Feet
Scale 1:20000
UNION
PACIFIC
20
21
22
23
24
25
26
27
28
29
32
33
34
35
36

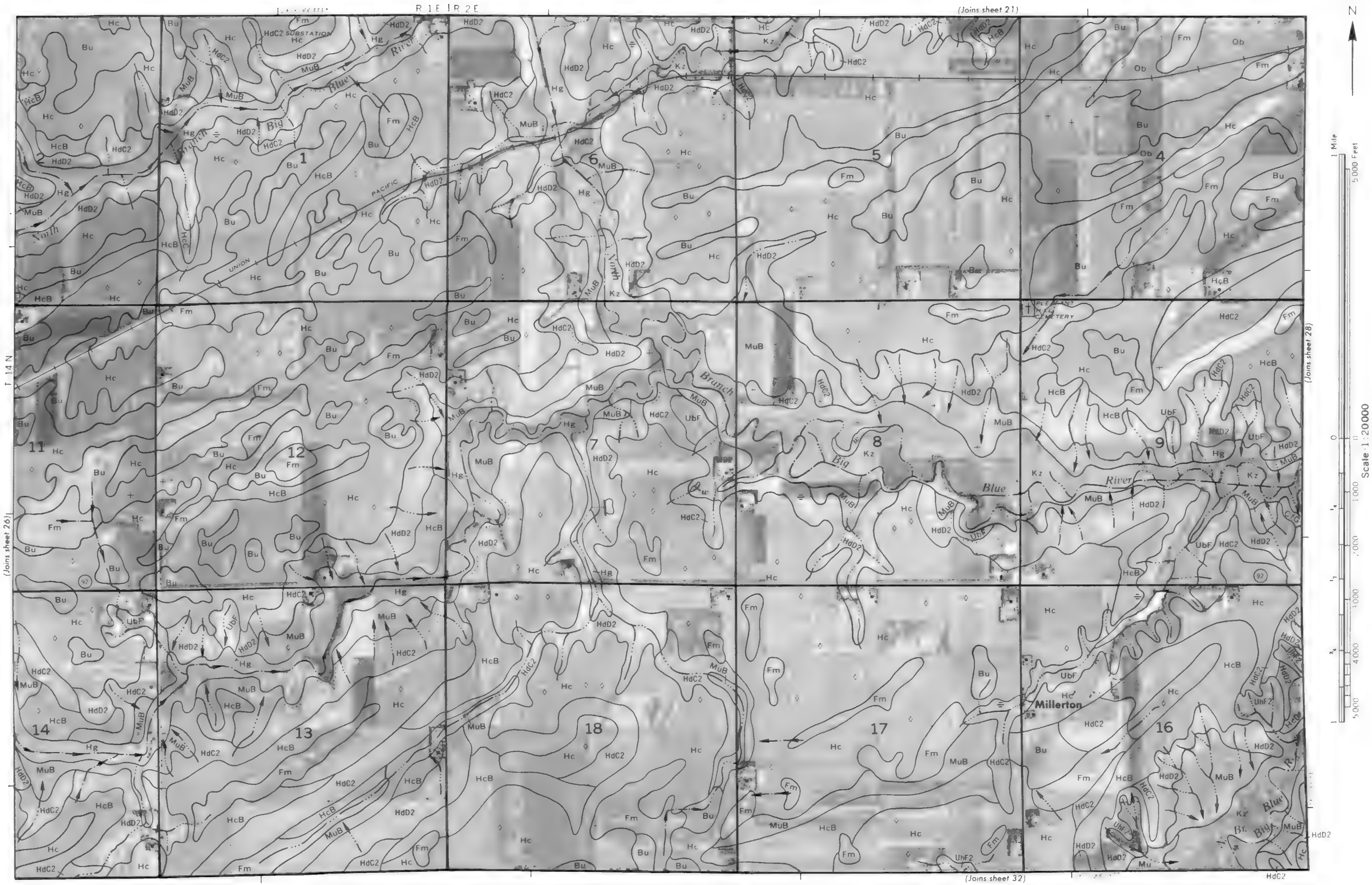

24
N
(Joins sheet 19)
R 4 E
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 30)
T 15 N
1 Mile
5000 Feet
Scale 1:20000
FRICKE CEMETERY
Skull Creek

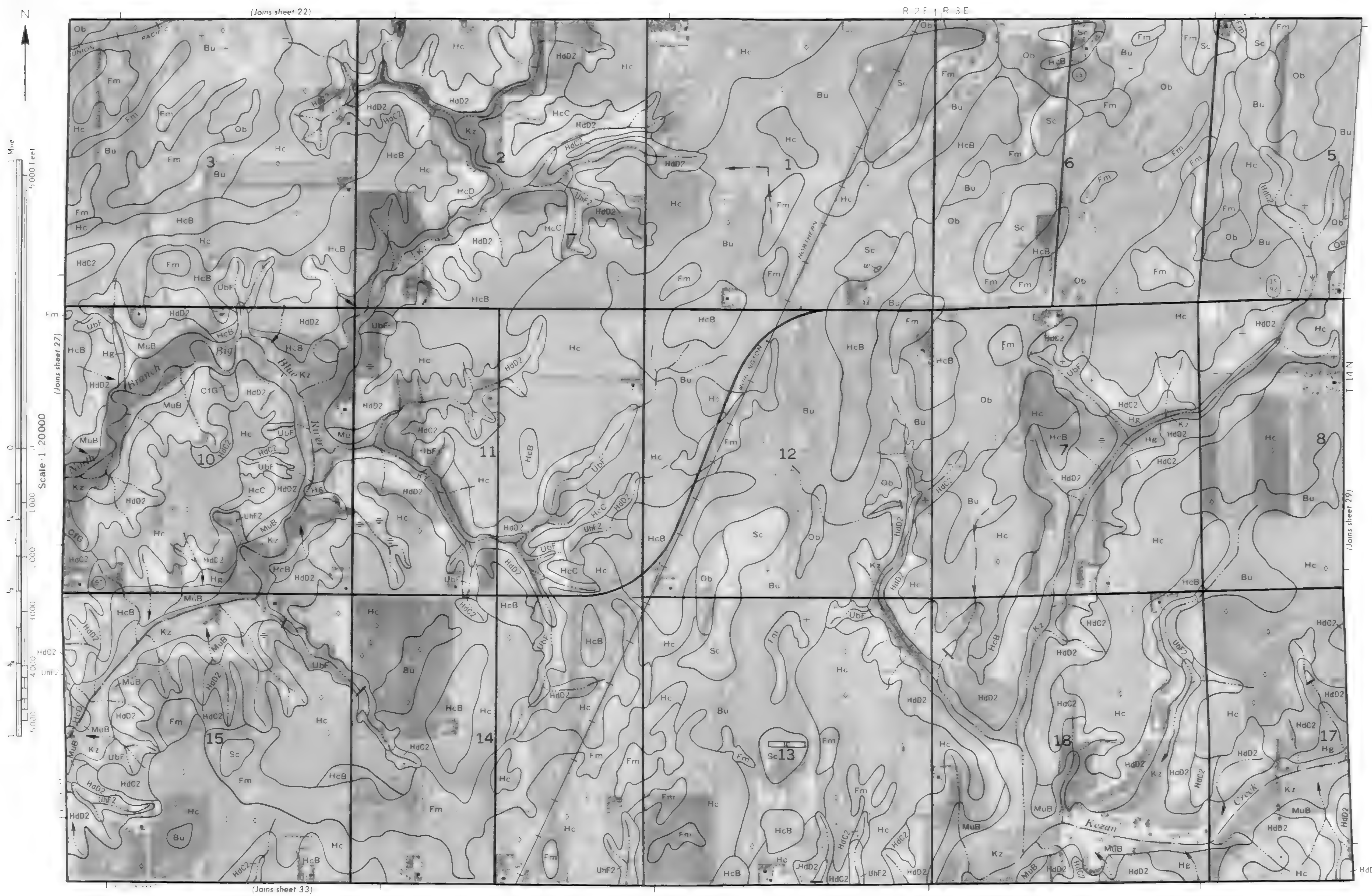

R 4 E
(Joins inset, sheet 14)
T 15 N
(Joins sheet 24)
SAUNDERS COUNTY
23
24
26
25
35
36
Skull Creek
(Joins inset, sheet 25)


R 4 E
(Joins sheet 25)
T 14 N
(Joins sheet 30)
SAUNDERS COUNTY
2
1
11
12
14
13
Skull Creek
Radio tower
(Joins sheet 36)

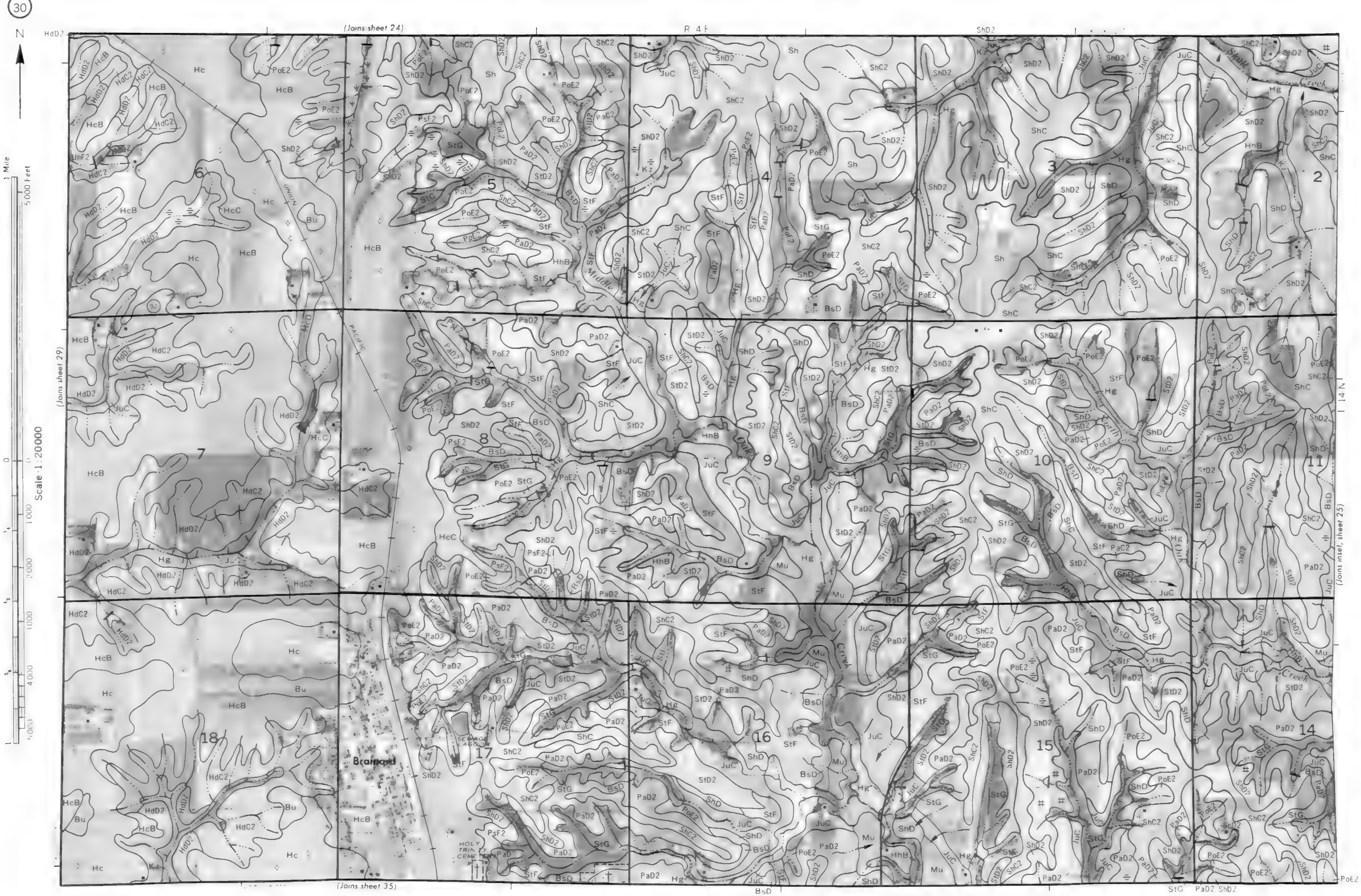

25
N
1 Mile
5000 Feet
Scale 1:20000


26
N
(Joins sheet 20)
R 1 E
(Joins sheet 27)
(Joins sheet 31)
T 14 N
Scale 1:20000
1 Mile
5000 Feet
POLK COUNTY
SIXTH PRINCIPAL MERIDIAN
FAIRVIEW CEMETERY
CIRCLE MOUND CEMETERY
SEWAGE LAGOON
UNION PACIFIC
Rising City
Big Blue River
South Branch


27
N
(Joins sheet 21)
(Joins sheet 26)
(Joins sheet 28)
(Joins sheet 32)
R 1 E | R 2 E
T 14 N
Scale 1:20000
1 Mile
5000 Feet
Millerton
North Branch Big Blue River
Big Blue River
UNION PACIFIC
SUBSTATION
PLEASANT HILL CEMETERY

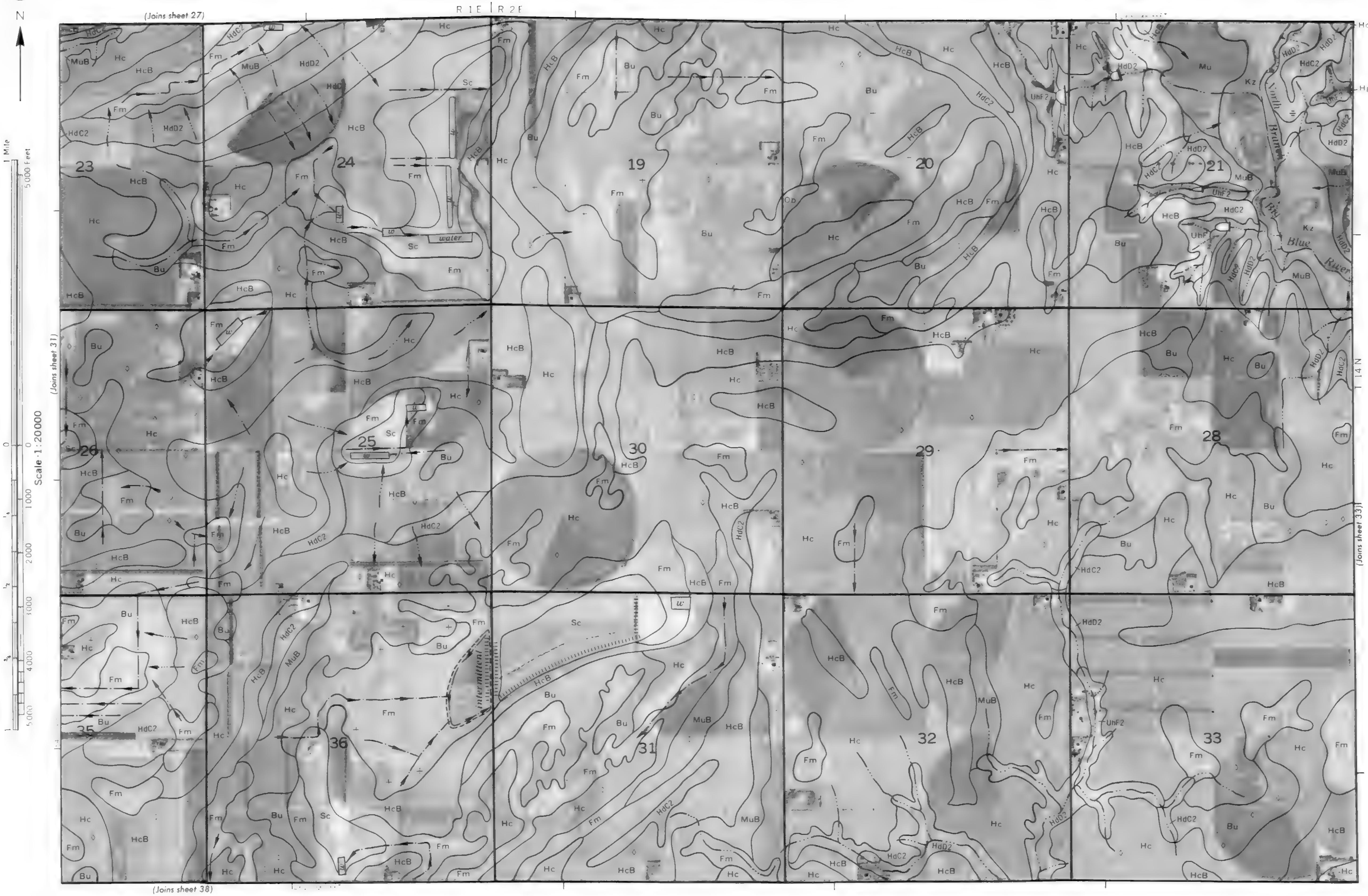

N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 22)
(Joins sheet 27)
(Joins sheet 29)
(Joins sheet 33)
R 2 E | R 3 E
T 14 N
UNION PACIFIC
NORTHERN
BURLINGTON
North Branch Big Blue River
Kezan Creek

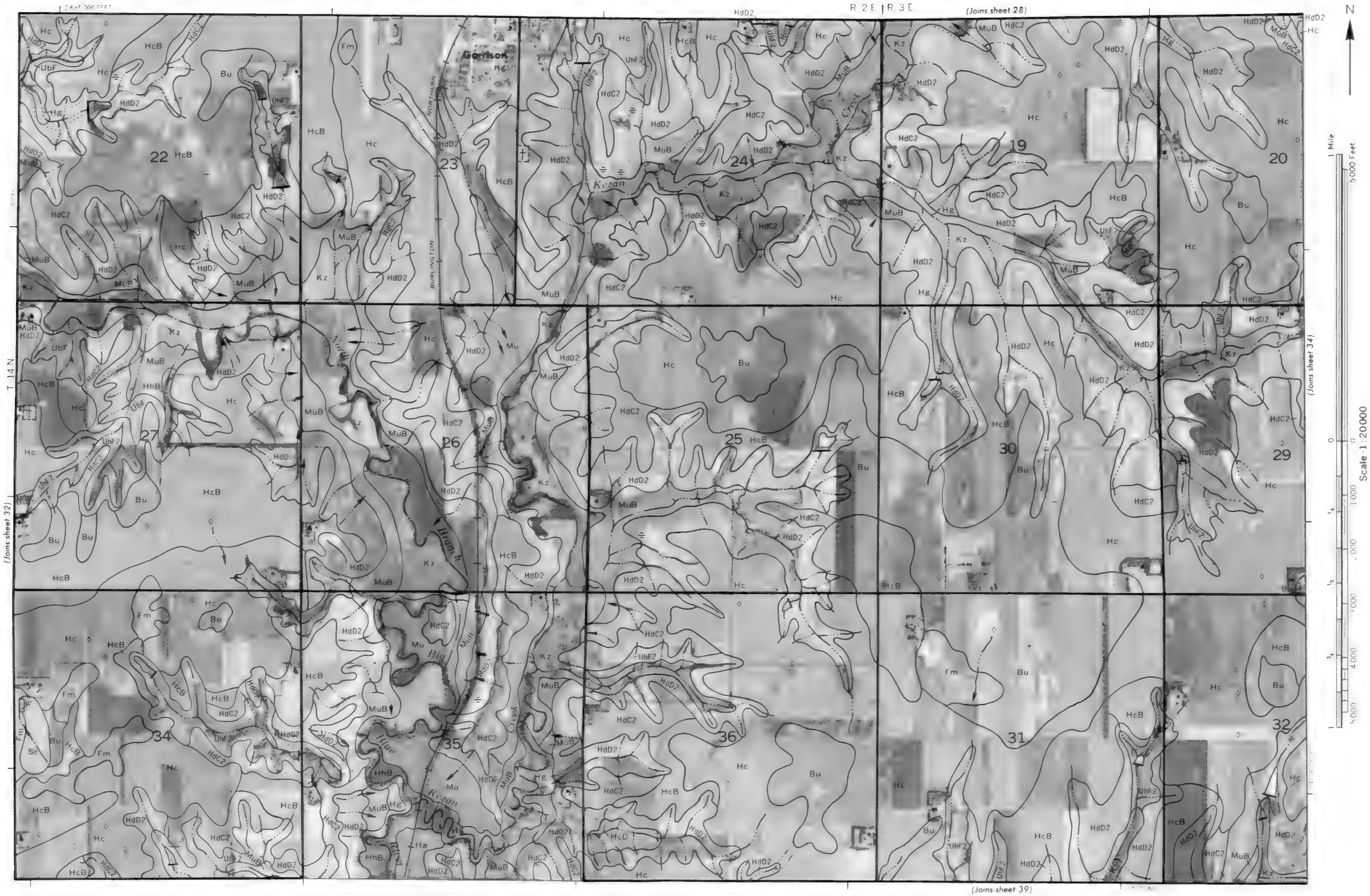

R 3 E
(Joins sheet 23)
(Joins sheet 28)
(Joins sheet 30)
(Joins sheet 34)
T 14 N
Kezan Creek
N
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000

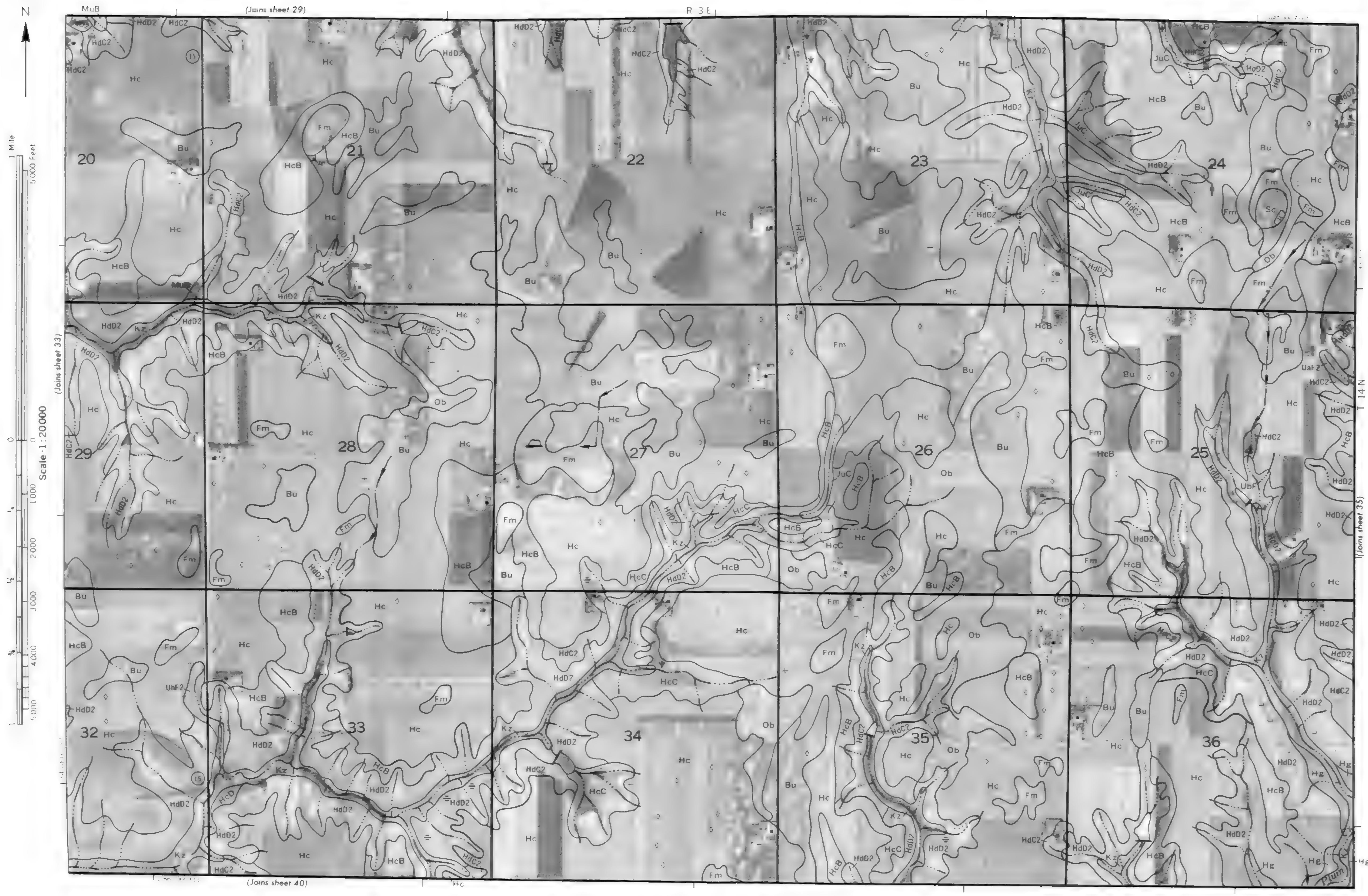

30
N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 24)
(Joins sheet 29)
(Joins sheet 35)
(Joins inset, sheet 25)
R 4 E
14 N
UNION PACIFIC
Brainard
SEWAGE LAGOON
HOLY TRINITY CEMETERY
Middle Creek
Oak Creek
Skull Creek
6
5
4
3
2
7
8
9
10
11
18
17
16
15
14

31

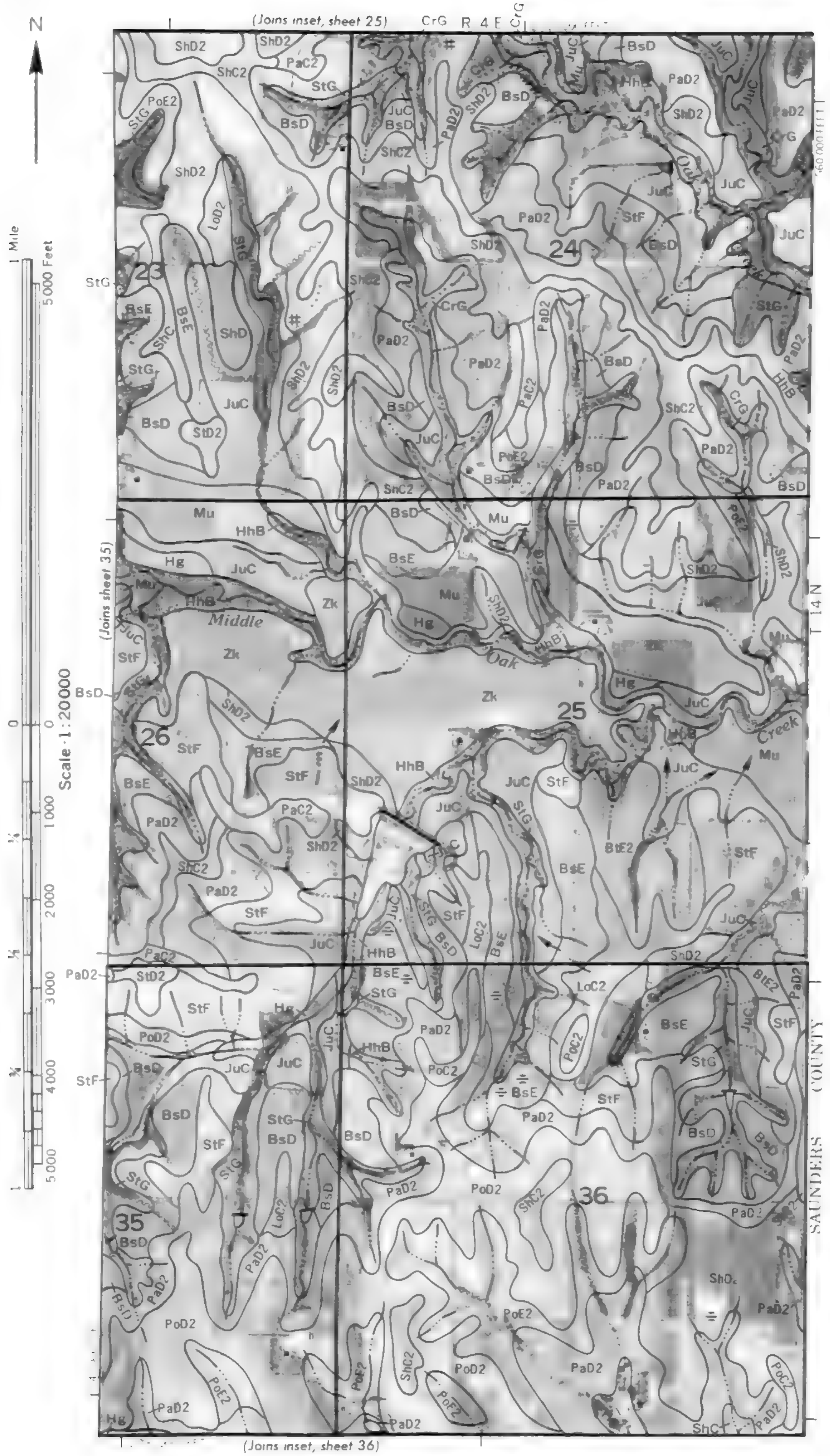

(Joins sheet 26)
(Joins sheet 32)
(Joins sheet 37)
R 1 E
T 14 N
POLK COUNTY
SIXTH PRINCIPAL MERIDIAN
RISING SUN CEMETERY
19
20
21
22
23
30
29
28
27
26
31
32
33
34
35
N
1 Mile
5000 Feet
Scale 1:20000

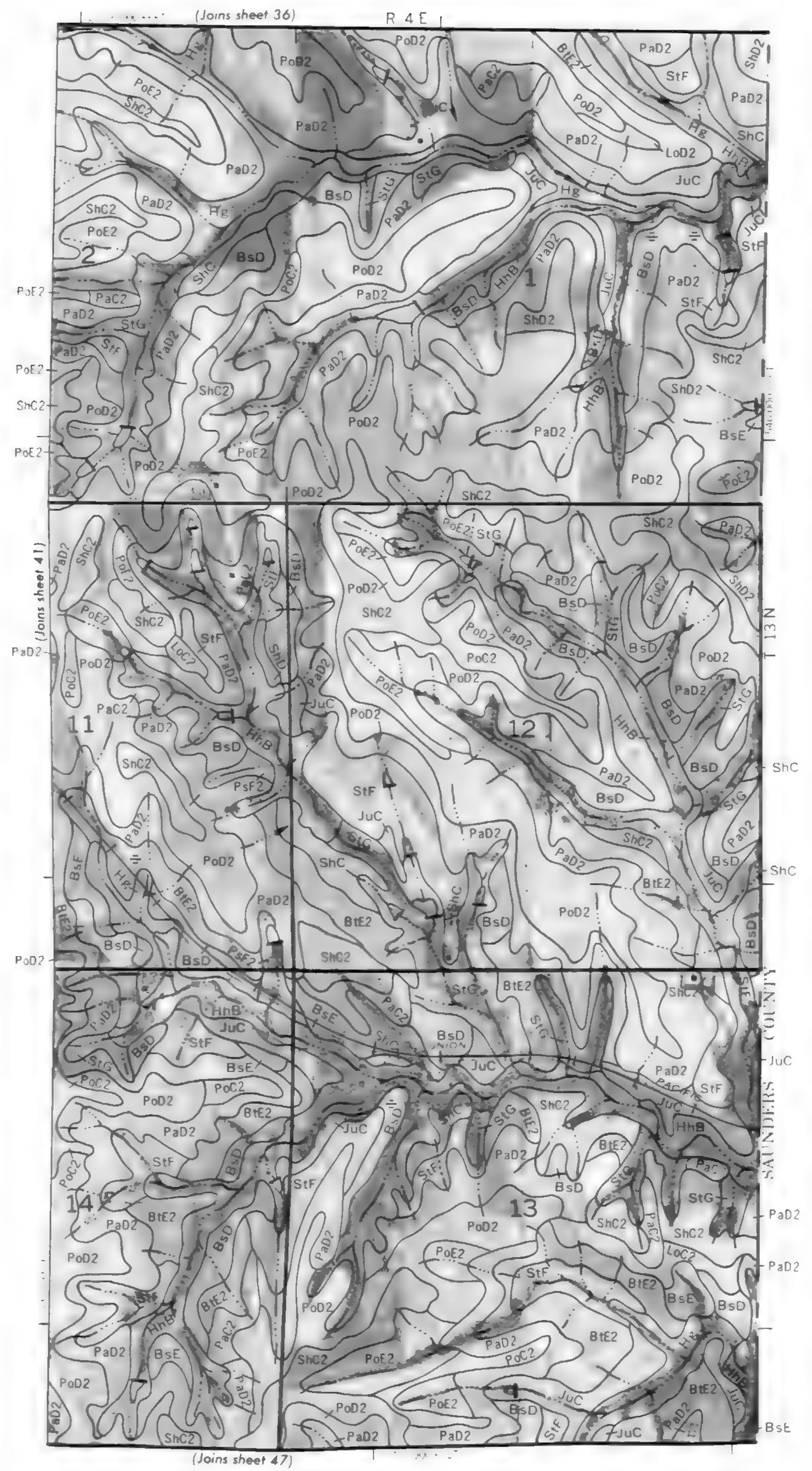

N
(Joins sheet 27)
R 1 E
R 2 E
(Joins sheet 31)
(Joins sheet 33)
(Joins sheet 38)
14 N
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000
19
20
21
23
24
25
26
28
29
30
31
32
33
35
36
North Branch Big Blue River
water
intermittent
Hc
HcB
HdC2
HdD2
Fm
Bu
MuB
Sc
UhF2
Kz
Ob
w

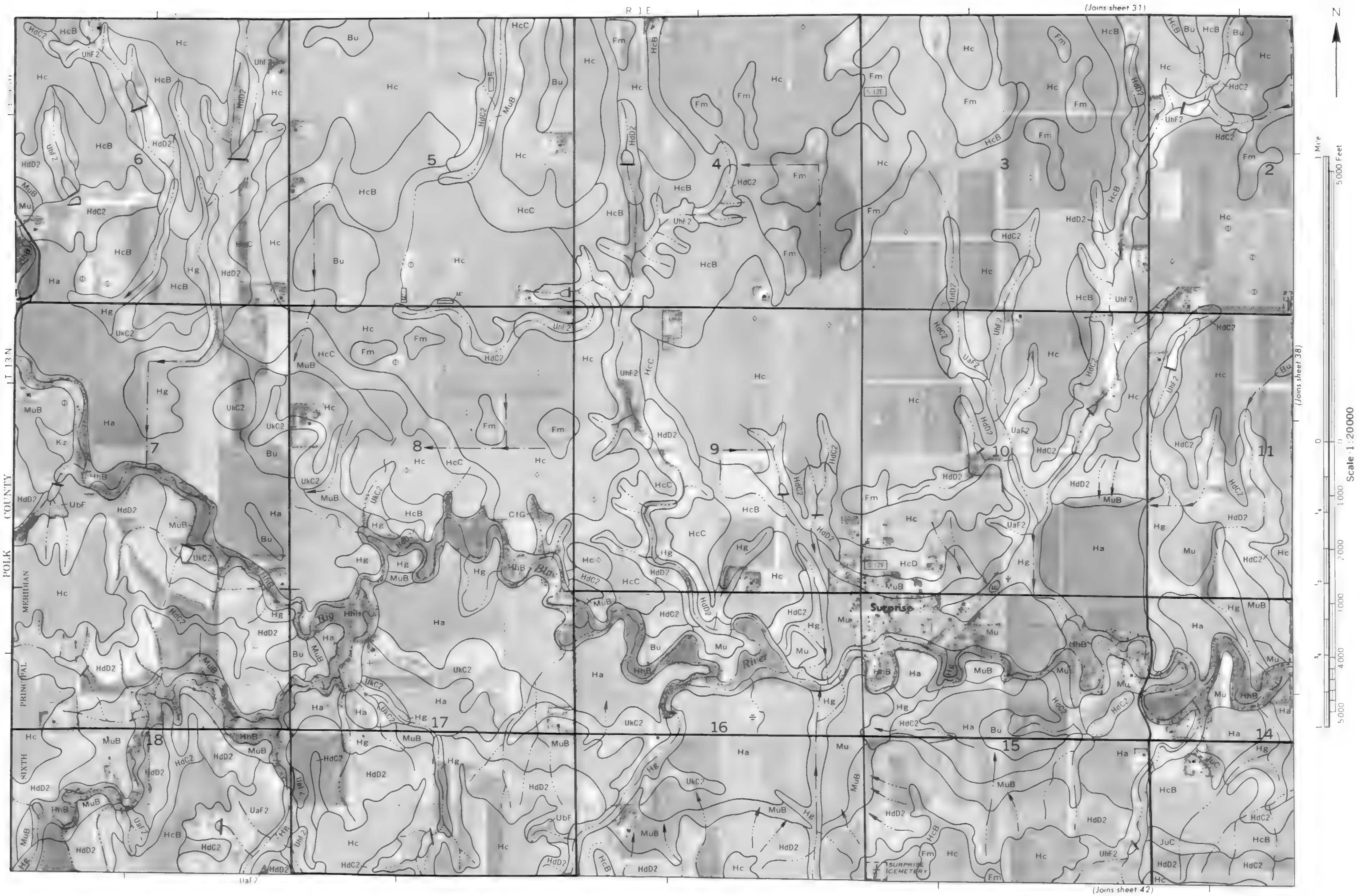

33
N
R 2 E | R 3 E
(Joins sheet 28)
(Joins sheet 34)
(Joins sheet 39)
(Joins sheet 32)
T 14 N
Garrison
Kezan
Creek
North
Branch
Big
Blue
River
BURLINGTON
NORTHERN
22
23
24
19
20
27
26
25
30
29
34
35
36
31
32
1 Mile
5000 Feet
Scale 1:20000

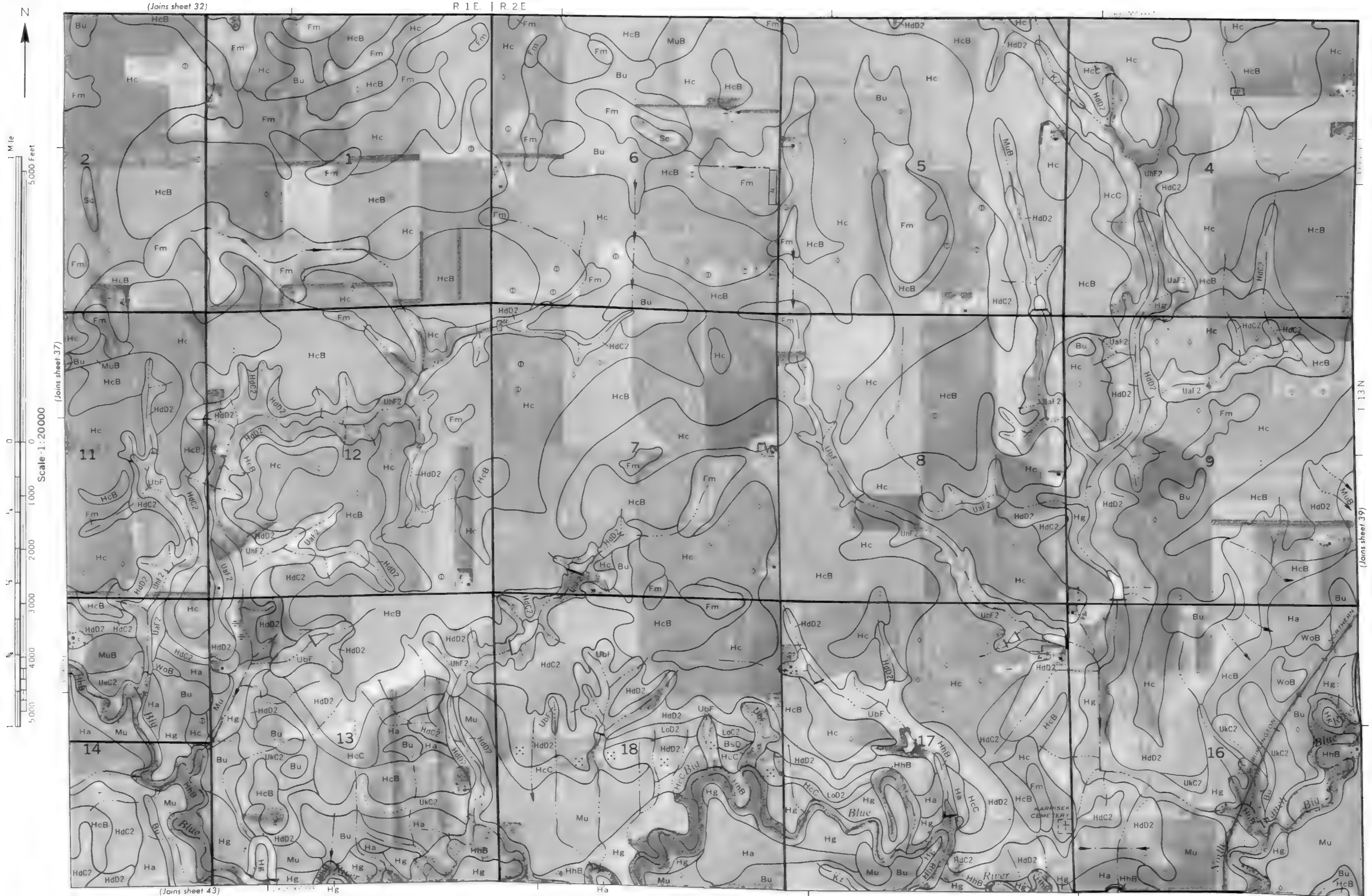

N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 29)
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 40)
R 3 E
T 14 N
20
21
22
23
24
29
28
27
26
25
32
33
34
35
36


35
N
R 4 E
T 14 N
JuC (Joins sheet 30)
(Joins sheet 34)
(Joins sheet 36)
PoD2 (Joins sheet 41)
Scale 1:20000
1 Mile
5000 Feet
19
20
21
22
23
30
29
28
27
26
31
32
33
34
35
Middle
Oak
Creek
Plum
UNION
PACIFIC
LOMA CEMETERY

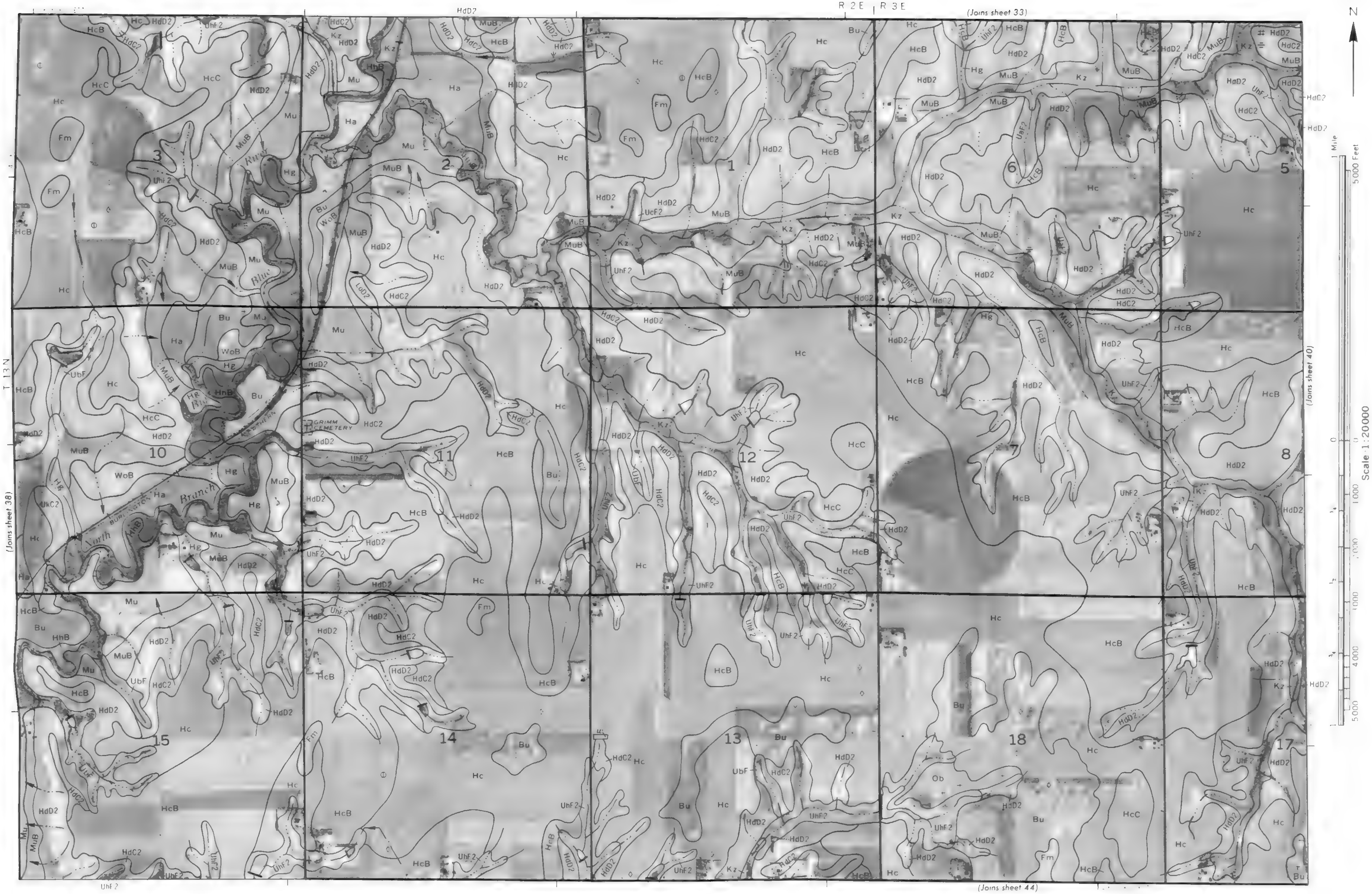

N
(Joins inset, sheet 25)
R 4 E
(Joins sheet 35)
T 14 N
Middle
Oak
Creek
SAUNDERS COUNTY
(Joins inset, sheet 36)
Scale 1:20000
1 Mile
5000 Feet


(Joins sheet 36)
R 4 E
(Joins sheet 41)
T 13 N
SAUNDERS COUNTY
(Joins sheet 47)

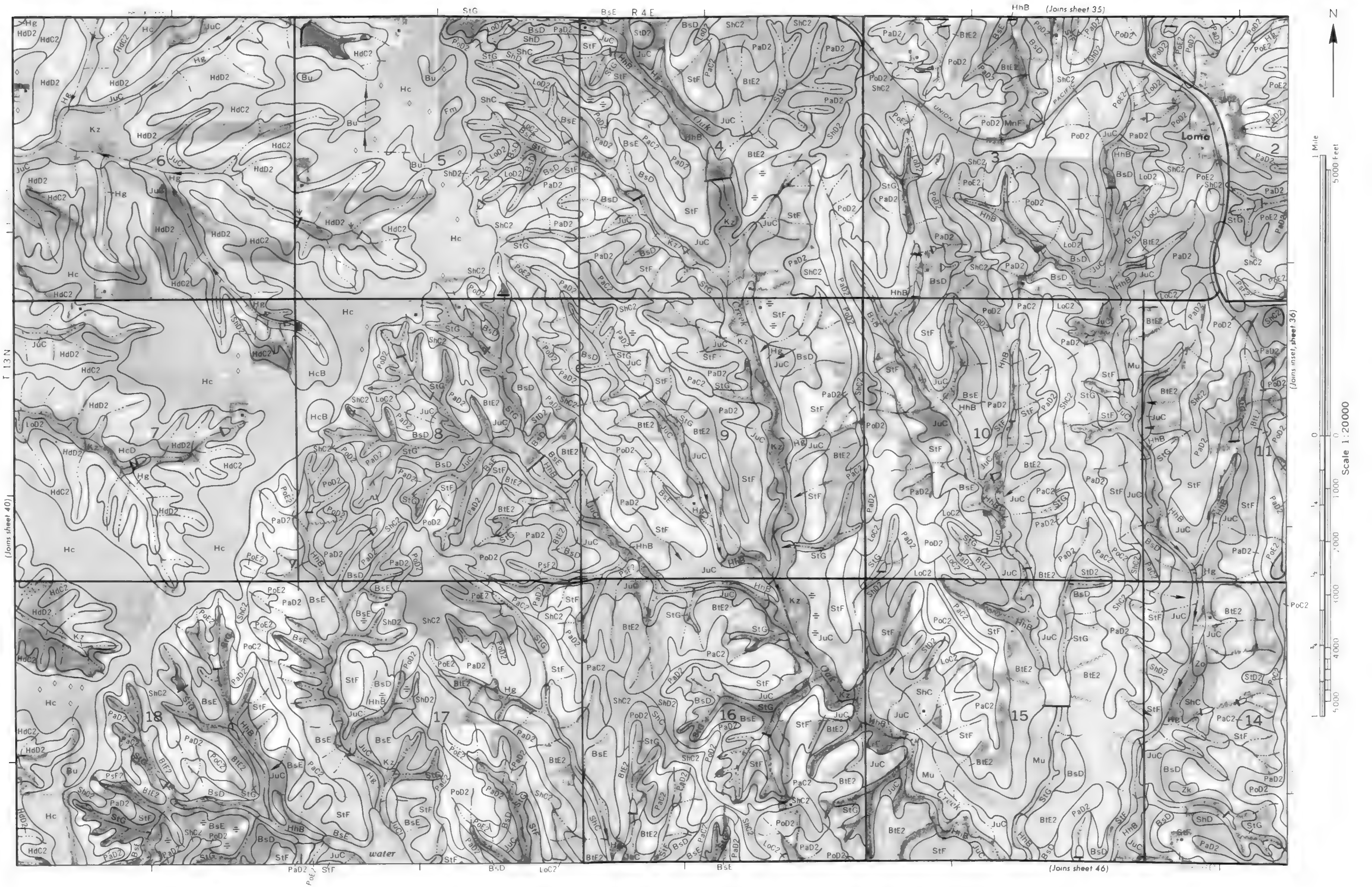

37
N
R 1 E
(Joins sheet 31)
(Joins sheet 38)
(Joins sheet 42)
T 13 N
POLK COUNTY
SIXTH PRINCIPAL MERIDIAN
Surprise
SURPRISE CEMETERY
Big Blue River
1 Mile
5000 Feet
Scale 1:20000
0 1000 2000 3000 4000 5000


(Joins sheet 32)
R 1 E. | R 2 E.
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 43)
T 13 N
N
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000
1
2
4
5
6
7
8
9
11
12
13
14
16
17
18
Big Blue River
HARRISEK CEMETERY

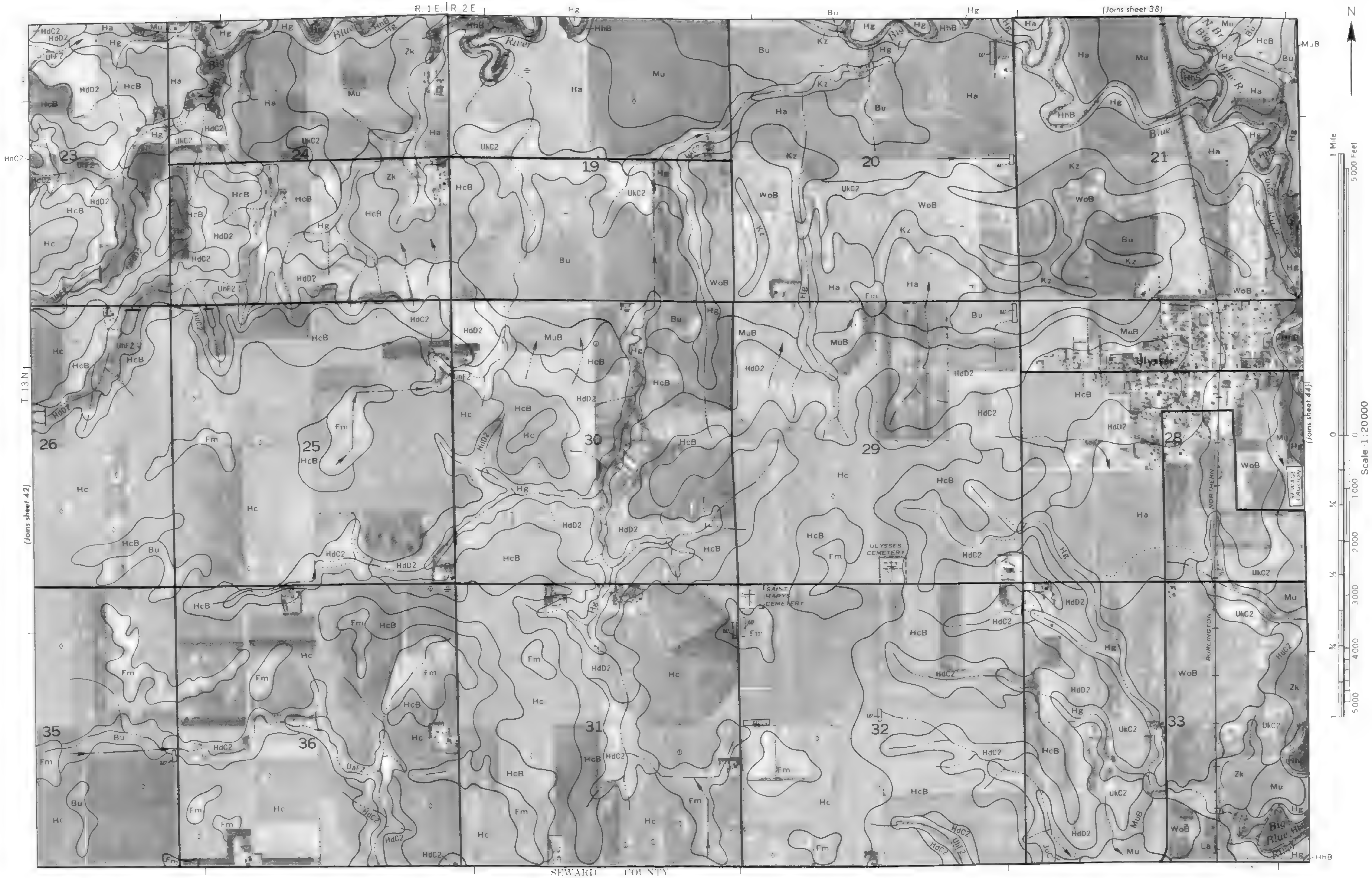
39


R 2 E | R 3 E
(Joins sheet 33)
(Joins sheet 38)
(Joins sheet 40)
(Joins sheet 44)
T 13 N
N
1 Mile
5000 Feet
Scale 1:20000
GRIMM CEMETERY
North Branch
Big Blue River
BURLINGTON
1
2
3
5
6
7
8
10
11
12
13
14
15
17
18
Hc
HcB
HcC
HdC2
HdD2
Mu
MuB
Ha
Hg
HnB
Kz
Bu
Fm
UhF2
UbF
WoB
Ob

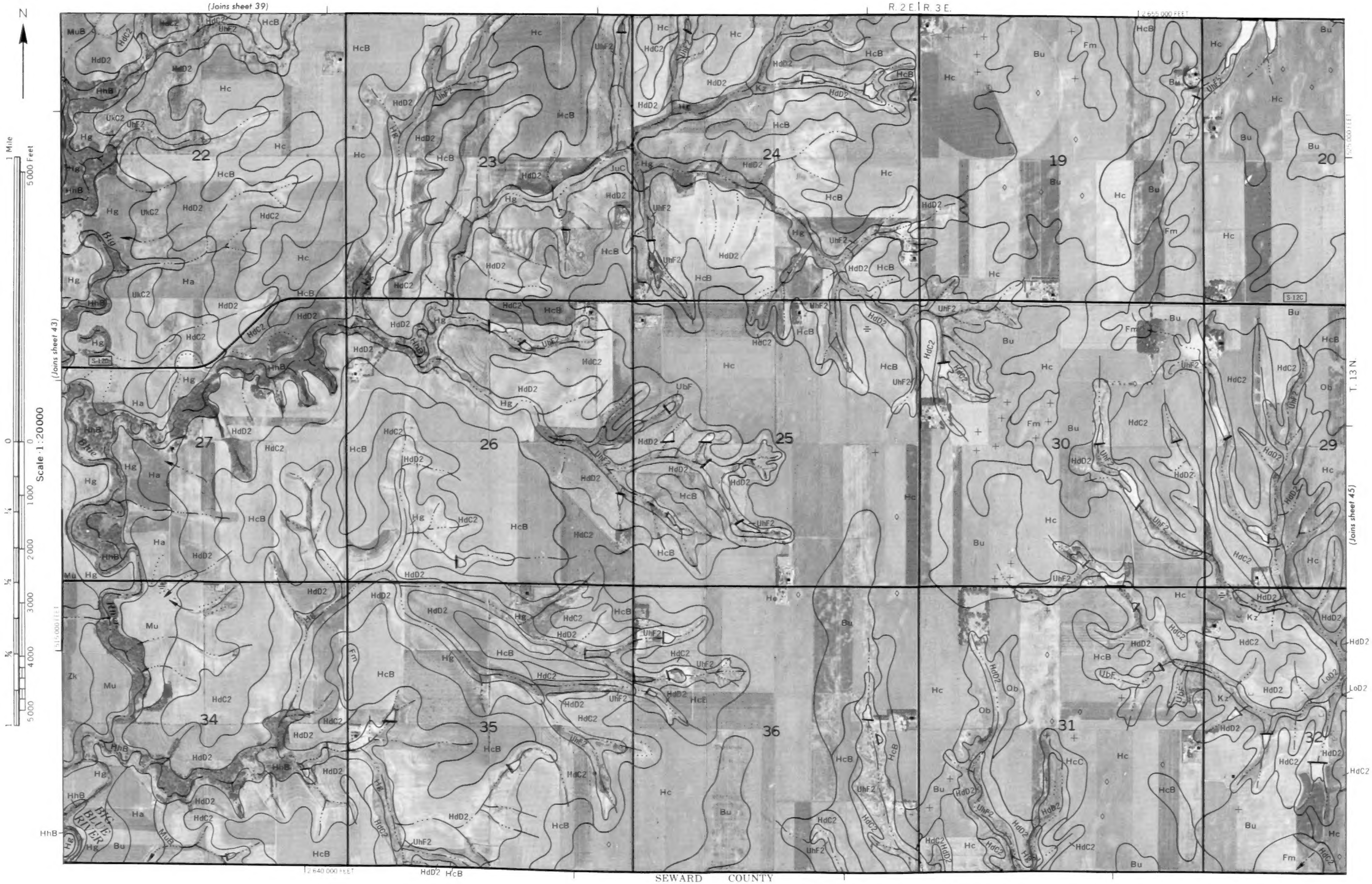

40
N
(Joins sheet 34)
(Joins sheet 39)
(Joins sheet 41)
(Joins sheet 45)
R 3 E
T 13 N
1 Mile
5000 Feet
Scale 1:20000
WARE CEMETERY
1
2
3
4
5
8
9
10
11
12
13
14
15
16
17


R 4 E
T 13 N
(Joins sheet 35)
(Joins inset, sheet 36)
(Joins sheet 40)
(Joins sheet 46)
N
Loma
UNION PACIFIC
Oak Creek
water
1 Mile
5000 Feet
Scale 1:20000

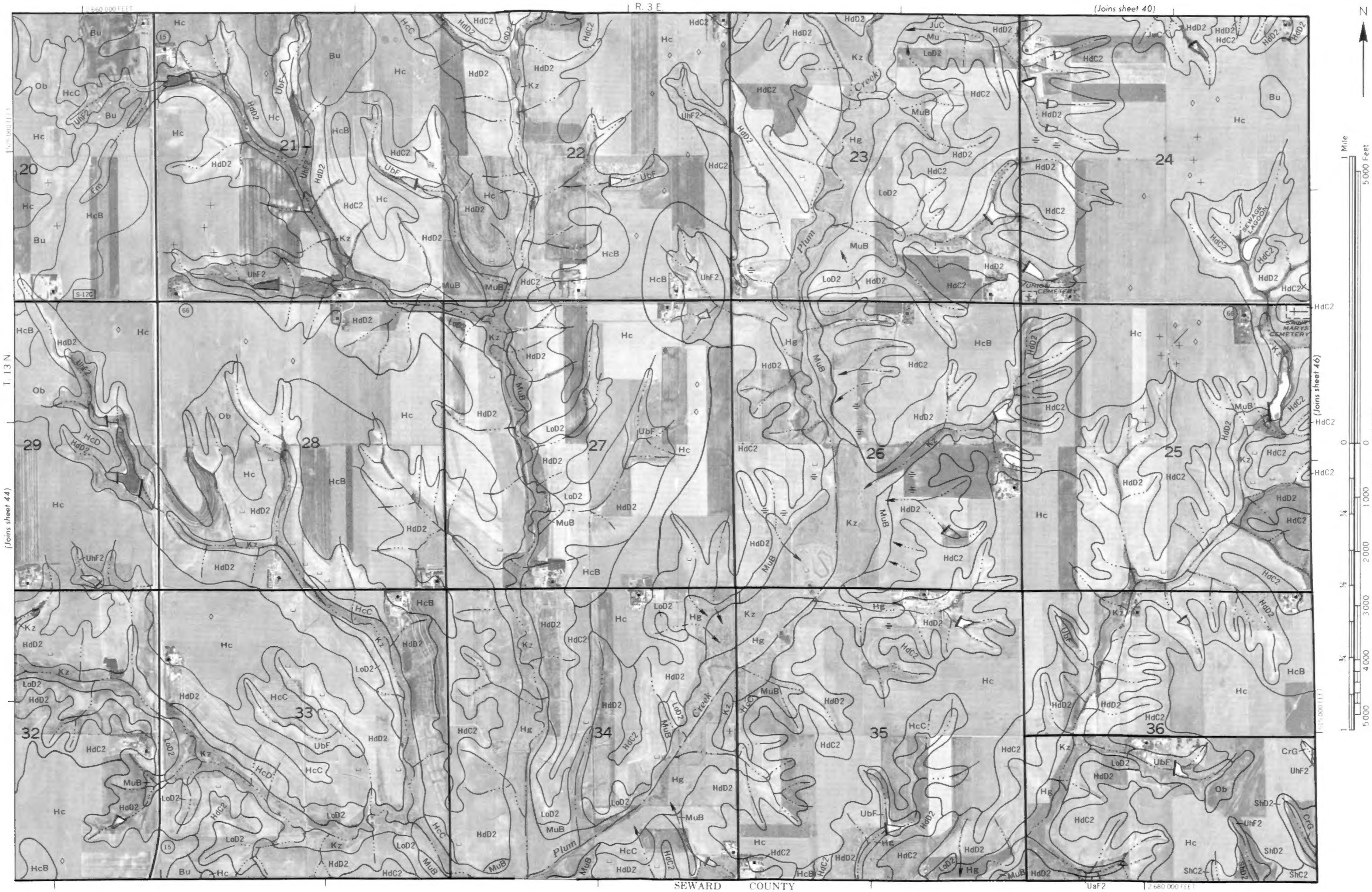
BUTLER COUNTY, NEBRASKA — SHEET NUMBER 42


43
N
R. 1 E. | R. 2 E.
(Joins sheet 38)
(Joins sheet 42)
(Joins sheet 44)
T. 13 N.
SEWARD COUNTY
Big Blue River
N. Br. Big Blue R.
Ulysses
ULYSSES CEMETERY
SAINT MARYS CEMETERY
SEWAGE LAGOON
NORTHERN
BURLINGTON
19
20
21
23
24
25
26
28
29
30
31
32
33
35
36
Scale 1:20000
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000

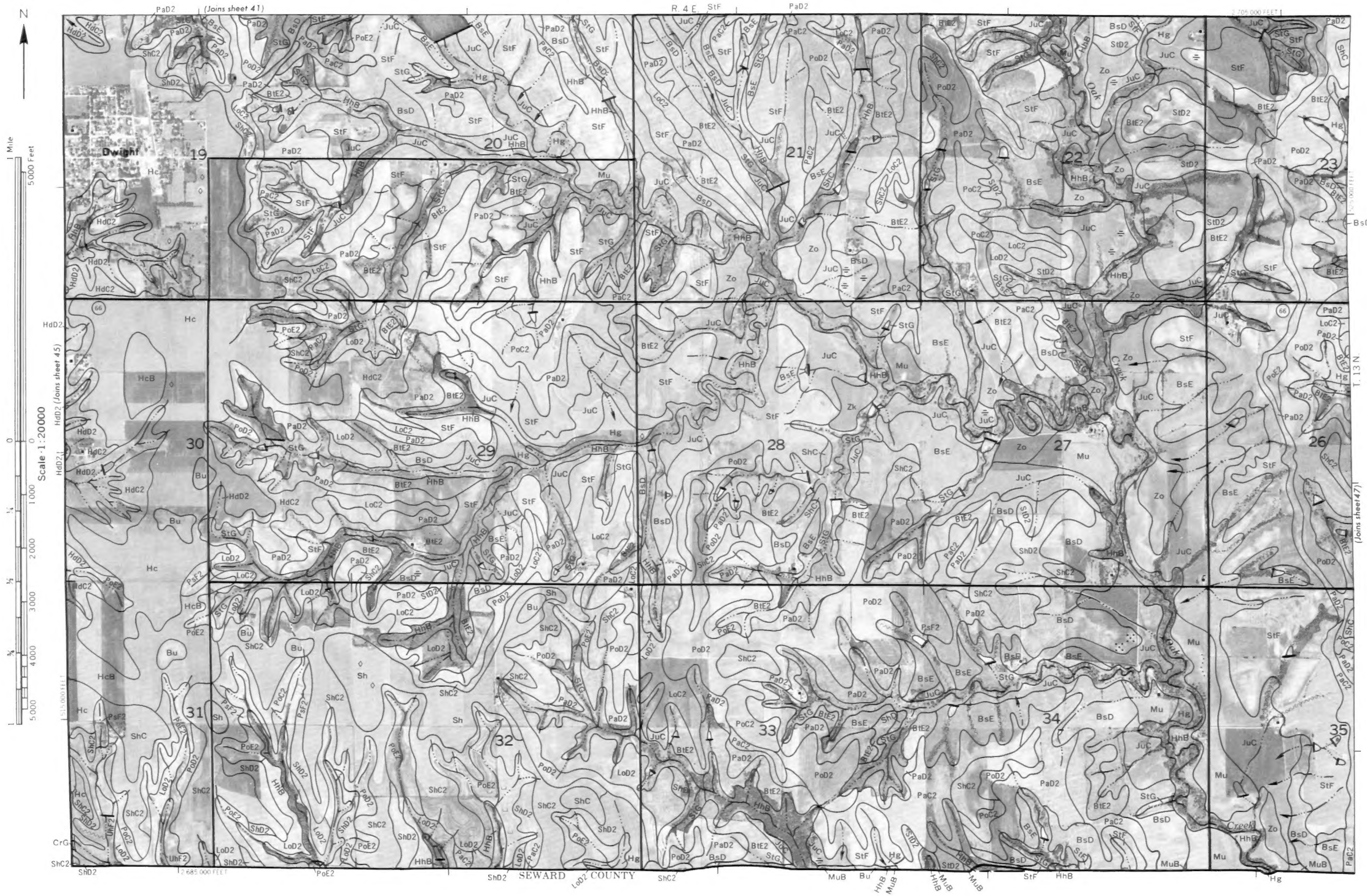
BUTLER COUNTY, NEBRASKA — SHEET NUMBER 44



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


R. 3 E.
(Joins sheet 40)
(Joins sheet 44)
(Joins sheet 46)
T. 13 N.
SEWARD COUNTY
Plum Creek
SEWAGE LAGOON
UNION CEMETERY
SAINT MARYS CEMETERY
20
21
22
23
24
25
26
27
28
29
32
33
34
35
36
N
1 Mile
5000 Feet
Scale 1:20000

BUTLER COUNTY, NEBRASKA — SHEET NUMBER 46



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.